



# THE ASSAM GAZETTE

অসাধাৰণ

EXTRAORDINARY

প্রাপ্ত কৰ্তৃত্বৰ দ্বাৰা প্ৰকাশিত

PUBLISHED BY THE AUTHORITY

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No. 136 Dispur, Friday, 3rd March, 2023, 12th Phalgun, 1944 (S. E.)

GOVERNMENT OF ASSAM  
ORDERS BY THE GOVERNOR  
DEPARTMENT OF HOUSING AND URBAN AFFAIRS

## NOTIFICATION

The 13th February, 2023

**No.ECF.274142/5.**- In exercise of the powers conferred by the Section 9 and sub-section (1) of Section 10 of the Assam Town & Country Planning Act, 1959 (as amended) and (Assam Act II of 1960) read with sub-rule (1) of Rules 3 of the Assam Town & Country Planning (Publication of Master Plan and Zoning Regulations) Rules 1962, the Governor of Assam is pleased to publish the following notice regarding the publication of the Draft Master Plan for Silapathar.

### Notice for publication of the Draft Master Plan for Silapathar

1. It is notified that the Draft Master Plan for Silapathar prepared by the Directorate of Town & Country Planning , Government of Assam, under Section 9 of Town & Country Planning Act, 1959 (as amended) read with sub-section 1 of Section 10 of Assam Town & Country Planning Act, 1959 (as amended) for the area described in the schedule below is here by published.
2. Any person or persons affected by the Draft Master Plan may submit their objections or opinions in writing to the Director, Town & Country Planning, Government of Assam, Dispur, Guwahati-6 within two months from the date of publication.
3. The Draft Master Plan for Silapathar with all relevant papers and maps may be inspected free of cost during the office hours at the office of Director, Town & Country Planning, Dispur, Guwahati-6, the Deputy Director, Town & Country Planning, Dist. Office – Dhemaji, office of the Chairman, Silapathar Municipal Board, Silapathar and Sisibargaon Circle office. Copies of the Draft Master Plan for Silapathar are available at the office of the Deputy Director, Town & Country Planning, Dist. Office – Dhemaji for sale on payment.

**SCHEDULE OF SILAPATHAR MASTER PLAN -**

District	:	Dhemaji
Revenue Circle	:	Sisiborgaon
Master Plan Area	:	53.37 Sq.km (5337 hectare)
Municipal Area	:	10.57 Sq.km (1057 hectare)
Sub-Division	:	Dhemaji
Thana	:	Silapathar

**REVENUE AREAS INCLUDED IN THE DRAFT MASTER PLAN FOR  
SILAPATHAR 2041**

1. Silapathar Municipal Area

2. Other Revenue Villages Includes in Planning area:

Rupahi Boragayan	Chila gaon	Lakhipathar Lakhipur
Phulbari nepali	Akajan miri gaon pt 1	Silapathar Na-Gaon
Phulbari Pathar	Kulmua gaon	Naharani Barjan
No. 1 Phulbari Nepali Block	Kulamua bengali gaon	Sarupam Jaji
No. 2 Phulbari Nepali Block	Kulamua kachari gaon	Bijoypur Maduri
Kulamua block pt 1	Kulamua baruah gaon	Phulbari Nepali
Kulamua block pt 2	Gelua gaon	2 No. Chila Gaon
Akajan bengali gaon	No. 2 Betanipam gaon	Chila Gutung
Jungaon nepali	Baratichuk	Phulbari Asamia
Mishing pur	Barati Gaon	Kenduguri Samabai
Memberchuk	No. 1 borpathar gohain gaon	Gelya kenduguri
No. 6 borgayan deuri	Rampur	No. 1 Chilapathar Block
No. 2 Chilapathar Block		

**DESCRIPTION OF BOUNDARIES :**

Listed below are some of the neighbouring villages surrounding the boundary of the Silapathar planning area.

**North** : Likabali Alikash, Shalakhani, Chilli Bijbari, Alu Para

**South** : Dablang Patri, Dablang Miri Pathar, Gelua Miri Pathar, No.2 Borgayadeori.

**East** : No.1 Sila Block, Likabali, Barikata Miri Pathar, No7 Borgayadeori

**West** : No. 3 Betanipam, Naharani Borjan, No1 Betanipam, Nalani Chuk.

**KAVITHA PADMANABHAN,**  
Commissioner & Secretary to the Government of Assam,  
Department of Housing and Urban Affairs,  
Dispur, Guwahati-6

## **INTRODUCTION AND CONTEXT**

## CHAPTER 1: INTRODUCTION

### 1.1. Background

Assam is the largest state in the northeastern part of India with respect to population and the second largest with respect to area after Arunachal Pradesh. The state covers around 68 percent of the total population of the northeast region and spreads over 78,438 sq. km covering around 30 percent of the total area of the region. Among all the northeastern states, Assam has the highest population density of 398 person per sq. km which is higher than the national average of 382 person per sq. km. Despite the high density, the state is also very rich in its biodiversity and natural resources like minerals, forest, water, and agriculture. It is surrounded by the neighboring hills of Arunachal Pradesh, major rivers such as the mighty Brahmaputra and Barak, thick forests and tea gardens which enhance the beauty of the region.

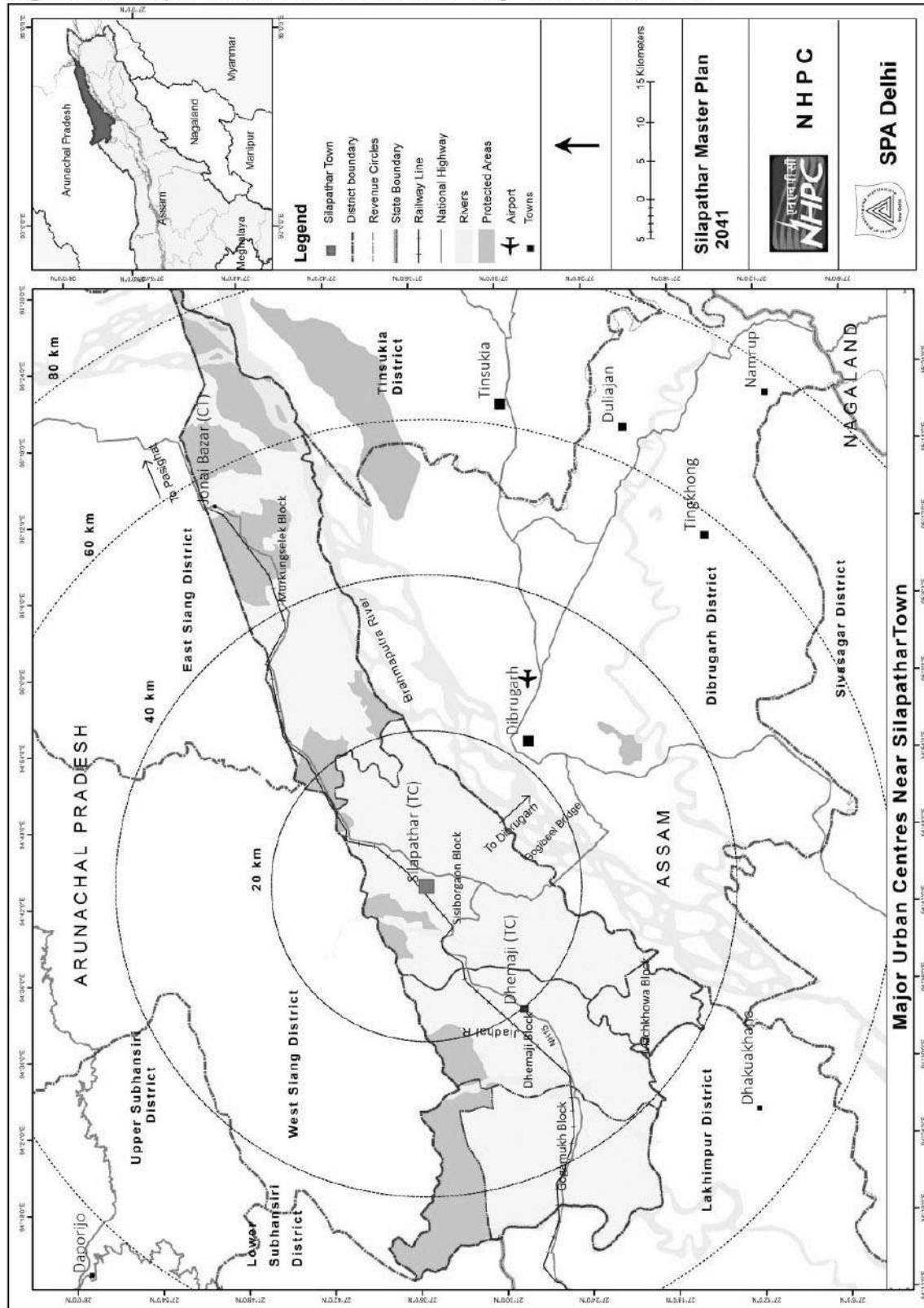
Silapathar town is located far northeast of the state. It is a small town and attained its town status in 1971. This area came to lime light during Chinese aggression in 1962. The Government of India developed army camp near Likabali, improved the road network and established a railway station during that time. Railway department had named the area as Silapathar which was desired by the local people of the area and the railway station was named after the name of the area i.e., Silapathar Railway Station. Gradually, the area expanded as commercial area and now Silapathar is a core commercial centre for neighbouring state Arunachal Pradesh as well its surrounding towns.

### 1.2. Location

Silapathar town is a growing commercial town of Assam in Sissiborgaon revenue circle of Dhemaji district. It is located at 94°43'12" E Longitude and 27°35'43" N Latitude. The town is situated on the northern bank of the Brahmaputra River and is about, 470 kilometres from Guwahati and is only 6 kilometres from the border of Assam and Arunachal Pradesh. Nearest railway station is Silapathar which is within the city and nearest airport is located at Dibrugarh district which is about 50 km away from the city, interstate bus and taxi connectivity are also available within the city. Because of its strategic location this town also supports commercial activities of Arunachal Pradesh. As seen in **Fig.1.1** the town is located to some of the major towns in Assam like Dibrugarh,

Tinsukia, Dhemaji etc. and the state of Arunachal within the range of 60 Kms which helps to provide good regional connectivity and relation with the town.

Figure 1.1: Major Urban Centers Around Silapathar Town, 2022



Source: SPA New Delhi (2022).

### 1.3. Silapathar Planning Area, 2041 and its Schedules

Silapathar Planning Area constitutes the Silapathar Municipal area of 10.57 sq.km and the surrounding 37 villages. The total area of the Silapathar Planning Area comprises of 53.37 sq.km.

#### 1.3.1. Schedule of Silapathar Planning Area

The schedule of the Master Plan for Silapathar includes the Silapathar municipal area of 10.57 sq.km and the planning area of 53.37 sq.km. The details of the schedule of the planning area are as follows.

District : Dhemaji, Assam

Sub-Division : Sissiborgaon, Assam

Municipal Area : 10.57 sq.km.

Master Plan Area : 53.37 sq.km.

#### 1.3.2. Description of Boundaries

Listed below are some of the neighbouring villages surrounding the boundary of the Silapathar planning area.

**North:** Likabali Alikash, Shalakhani, Chilli Bijbari, Alu Para

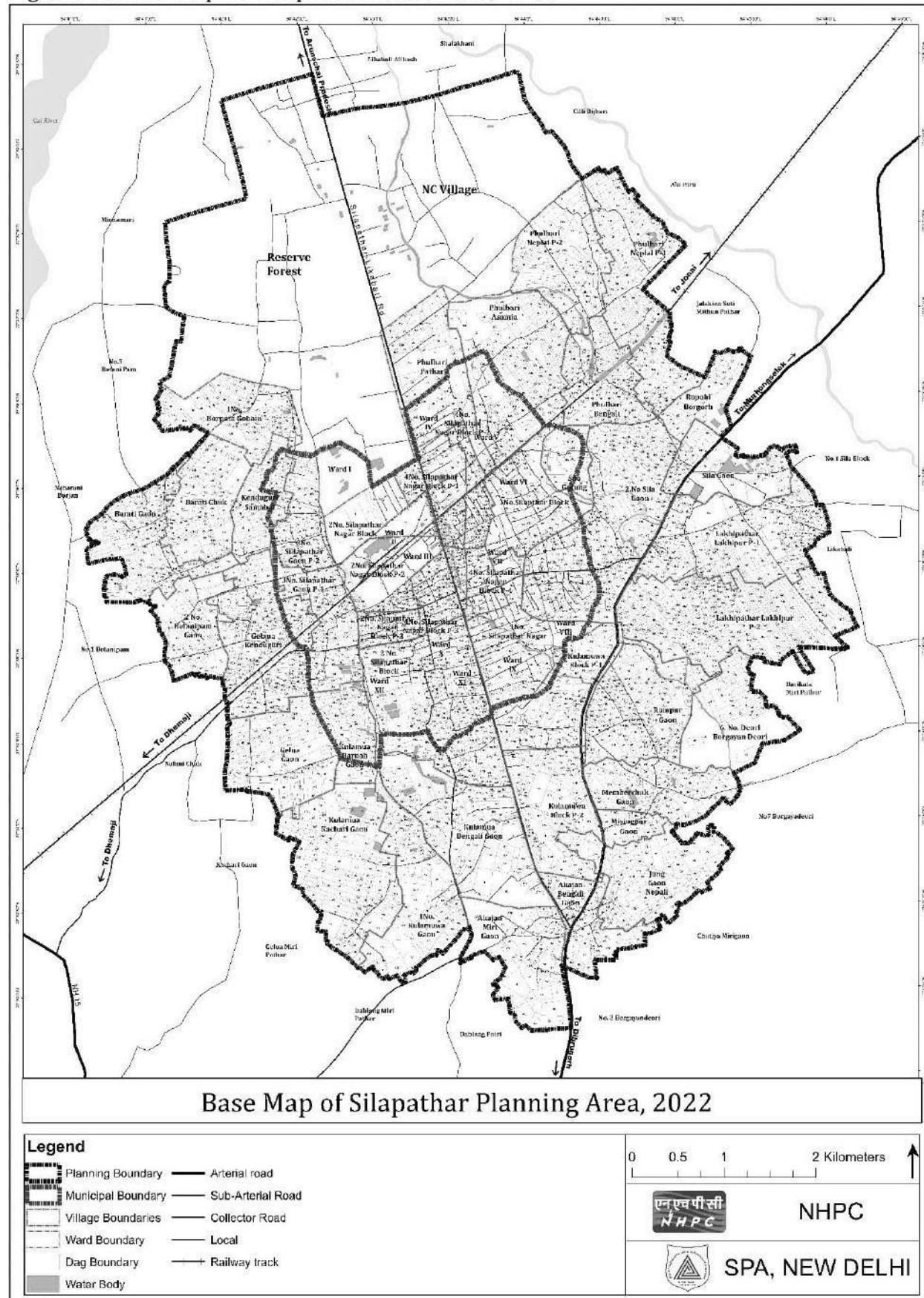
**South:** Dablang Patri, Dablang Miri Pathar, Gelua Miri Pathar, No.2 Borgayadeori

**East:** No.1 Sila Block, Likabali, Barikata Miri Pathar, No7 Borgayadeori

**West:** No. 3 Betanipam, Naharani Borjan, No1 Betanipam, Nalani Chuk

A contour map has also been generated at an interval of three meters for the entire planning area. Based on this, levels of all the major roads have been calculated from the mean sea level. The zero point of Silapathar town has been pinned at the railway station as shown in **Figure 1.3.**

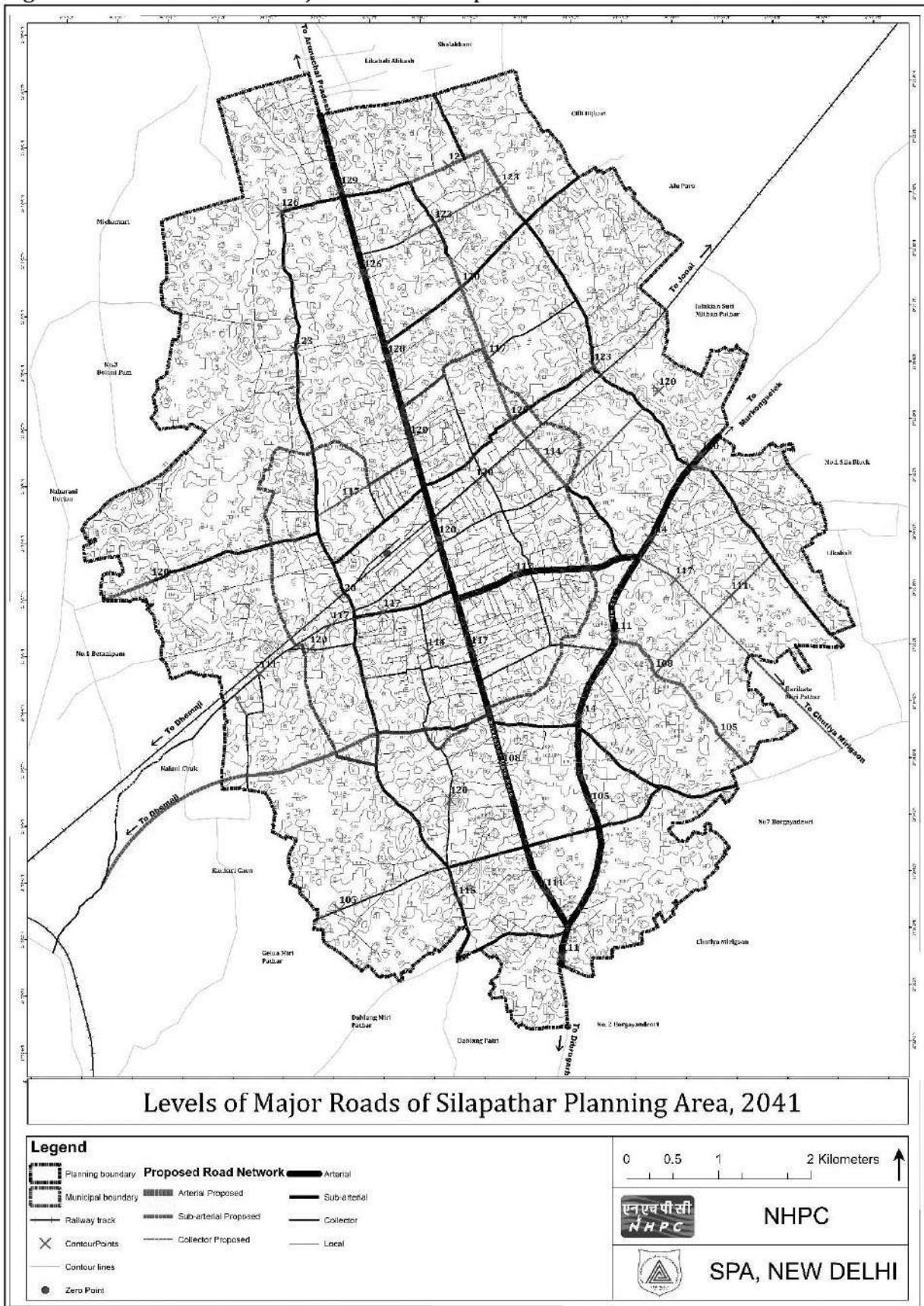
Figure 1.2: Base Map for Silapathar Master Plan, 2041



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Source: SPA New Delhi, (2022)

Figure 1.3: Road Levels of Major Roads in Silapathar 2022



Source: SPA New Delhi, (2022)

#### 1.4. Brief History of Silapathar Town

The name Silapathar derived from the flowing nature of stream. It has been stated that the flowing nature of the stream contain a thin layer of waves called Sil, Sil, and from this, the town got the name Sila and the embankment of river was highland (above 25-30 ft. high), which is locally called Gorah, hence the area was once known as Sila-bor-gorah. In the year 1950 great earthquake divested this area and submerged the Sila-bor-gorah and from that onwards this area was known as Silapathar.

Another view the name of Silapathar is that during 1950 earthquake, this area was flooded and enormous pebbles, stones (Sil) came along with water from the mountains and spread in and around this area, hence the area is called Silapathar. In 1978, market area of Silapathar, achieved the status of Community Town and in the year 1997, this community town has been upgraded to Silapathar Town Committee as per rules.

#### 1.5. Master Plan of Silapathar Town

Master Plan is a legal document for the development of urban area prepared to a specific time horizon. The Town and Country Planning Act, 1959 of Assam provides the guidelines for preparation of Master Plan or Development Plans for urban settlements in Assam. This Act was an important effort to ensure planned development of towns in Assam which had started in the year 1955, but it got a boost after the act was brought up on the ground. Directorate of Town and Country Planning of Assam is responsible to prepare master plans for urban areas under this Act of 1959 (as amended).

Table 1.1: Master Plans of Assam

<b>1.</b>	Total towns in Assam	<b>97</b>
<b>2.</b>	Final Master Plans prepared	<b>28</b>
<b>3.</b>	Draft Master Plans prepared	<b>10</b>
<b>4.</b>	Draft Master Plans under preparation	<b>47</b>

Source: Directorate of Town and Country Planning, Government of Assam (2021).

As per the Directorate of Town and Country Planning, Assam, out of the 97 town in Assam, Master Plans for 28 towns had already been prepared. Draft Master Plans for 10 towns had also been completed under which Silapathar town is one of the town and Master Plans for 47 towns are under preparation as shown in **Table 1.1**. Name of towns for which Master

plans, draft Master plans have been prepared and towns for which Master plans under revision and preparations so far are given in **Table 1.2.**

Table 1.2: Name of Towns for Which Master Plans is Prepared in Assam, 2022

Final Master Plans completed		Under Revision		Draft Master Plan Completed		Draft Master Plan under Revision	
No. of Towns	Name of Towns	No. of Towns	Name of Towns	No. of Towns	Name of Towns	No. of Towns	Name of Towns
15	Dibrugarh, Sivasagar, Tezpur, Bongaigaon, Biswanath Charali, Nazira-Simaluguri, Dhubri, Barpeta, Dergaon, Goalpar, Namrup, Rangia, Palasbari-Mirza-Bijoynagar, Naharkatia, Dhemaji	13	Tinsukia, Jorhat, Golaghat, Nagaon, Diphu, Silchar, Nalbari, North Lakhimpur, Jagiroad, Karimganj, Kokrajhar	12	Sonapur, Silapathar, Marigaon, Lakhipur, Gossaigaon, Dhekiajuli, Hamren, Mangaldoi, Sonari,	45	Tangla, Bijni, Hojai, Rangapara, Barpeta, aroad, Baihata-Changsari, Morioni, Kharupetia, Howly, Basugaon, Badarpur, Abhayapuri, Chapar, Gahpur, Bokajan, Sarupathar, Lakhipur(G), Digboi, Lanka, DoomDooma, Tihu, Sarthebari, Sorbhog, Halflong, Lumding, AmGuri, Barpathar, Chabura, Dokmoka, Bokakhat, Lala, Pathsala, Sapatgram, Raha, Dhing, Doboka, Kampur, Dogkamokam, Narayanpur, Bihpuria, Sapakhoa, Kajalgaon, Majuli, Dhakuakhana, Titabar.

Source: Directorate of Town and Country Planning, Government of Assam (2021).

## 1.6. Connectivity

### 1.6.1. Road Connectivity

Silapathar town is well connected with roads and rail connectivity. The topography of the town is almost plain, so the town has good roads along the main axis. However, low altitude areas of the town are affected due to flash flood that often breaches and damages the smaller roads and the railway lines. The total length of road constructed till date is 71.59 km.

#### 1.6.2. Railway Connectivity

The town is served by the Silapathar railway station of Rangia Railway Division by broad-gauge railway line which is under North Frontier Railway Zone. Silapathar railway station connects to major towns like Dibrugarh, Dhemaji, and Guwahati, etc. The station is approximately around two kilometres away from the main town and is easily accessible by any kind of transportation mode.

#### 1.6.3. Air Connectivity

The nearest airport of Silapathar town is Dibrugarh airport which is also known as the Mohanbari Airport around 60 km away from the town. The Dibrugarh airport provides daily flights to the national capital of New Delhi. In addition, there are flights from Dibrugarh to Ahmedabad, Kolkata, and Dimapur. The Pawan Hans Helicopter Service is also available to Pasighat, Itanagar, and Nahar Lagun. The most popular routes with 8 and seven weekly flights respectively are Dibrugarh to Ahmedabad and Dibrugarh and New Delhi.

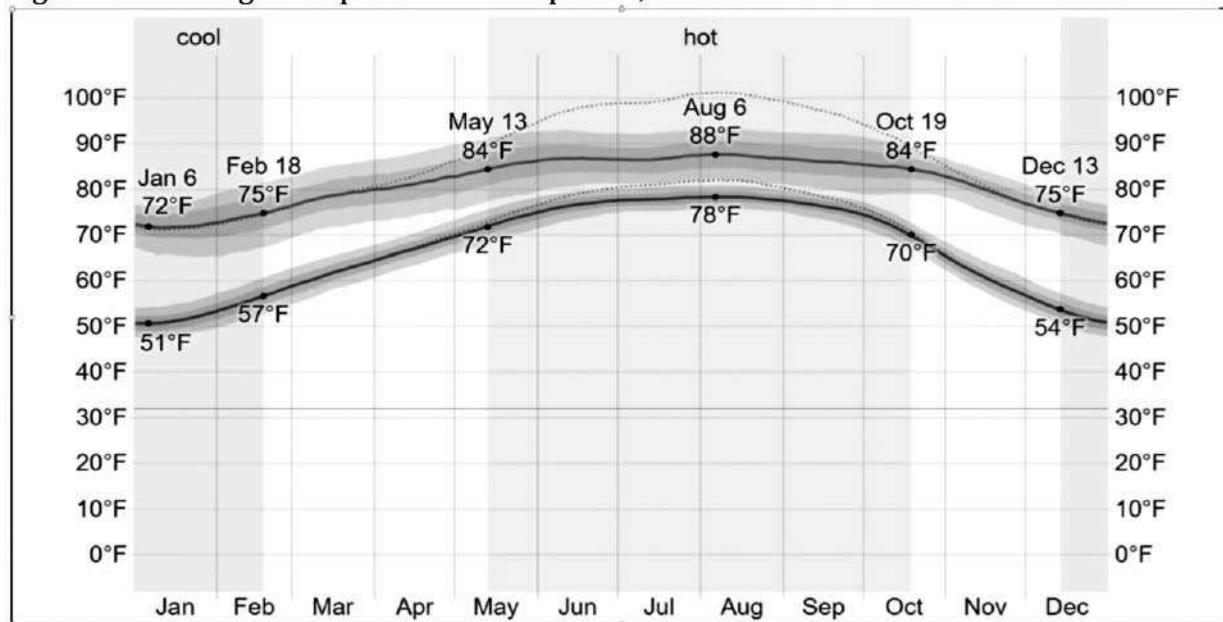
### 1.7. Climate

Since Silapathar town is located near the foothills of Arunachal, the climate is characterised by the absence of hot summer season. The climate of the area is humid, characterised by high rainfall, mild dry summer, and winter. Highest temperature is experienced during the southwest monsoon season along with abundant rainfall.

#### 1.7.1. Average Temperature

In Silapathar the hot season lasts for around six months starting from May to October, with an average daily high temperature above 84°F. The hottest month of the year in Silapathar town is during the month of August, with an average high of 87°F and average low of 78°F (**See Figure 1.4**).

Figure 1.4: Average Temperature of Silapathar, 2022



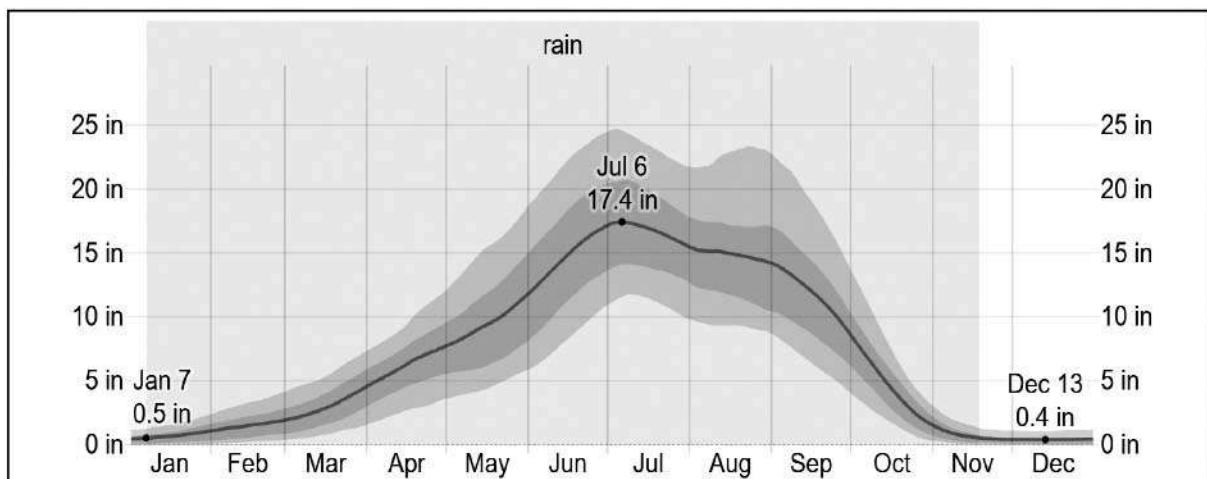
Source: [weatherspark.com](https://www.weatherspark.com)

The cool season lasts for only around two months, from December 13 to February 18, with an average daily high temperature below 75°F. The coldest month of the year in Silapathar is during the month of August, with an average high of 51°F and low of 72°.

#### 1.7.2. Average Rainfall of Silapathar, 2022

The rainy period of the year lasts for ten months, from January to November, with a 31-day rainfall of at least 0.5 inches of precipitation. The heavy rainfall generally begins from April and continues till September. The month with the most rain in Silapathar is July, with an average rainfall of 16.9 inches (**See Figure 1.5**).

Figure 1.5: Average Rainfall of Silapathar, 2022.



Source: [weatherspark.com](https://www.weatherspark.com)

The rainless period of the year lasts for only three months, from November to January. The month with the least rain in Silapathar is December, with an average rainfall of 0.4 inches.

### 1.8. Topography

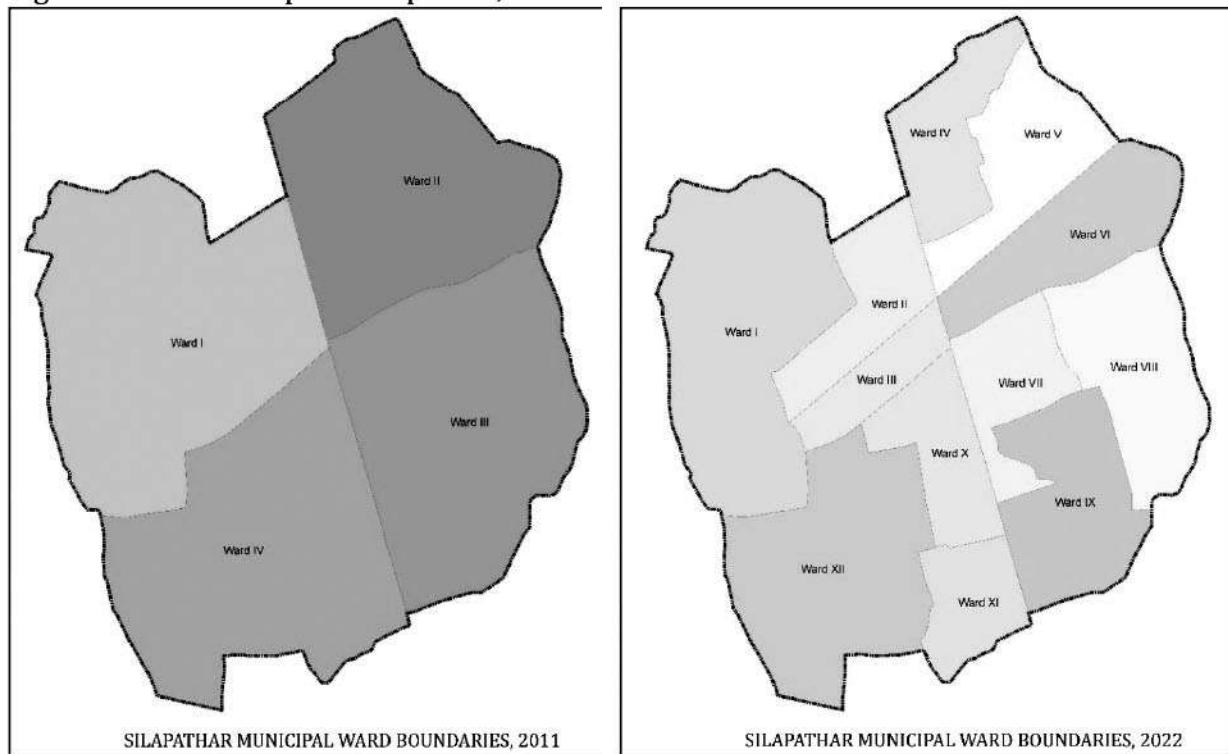
Silapathar town has an average elevation of 1,874.22 metres above sea level. There are high hills (up to 2,500 m) spread over many areas in the district. The town is in a strategic location where steep slope of eastern Himalayas abruptly drop forming a narrow valley, which widens towards the western side. Numerous drainage systems originates from the hills of Arunachal Pradesh and flow through this narrow valley ends at the mighty Brahmaputra River. After the confluence the three mighty rivers i.e., Dihing, Dibang and Lohit from their hilly course to the valley exert tremendous impact of peak runoff at the eastern most corner of Dhemaji District. This area can broadly be divided into three physiographic zones.

- **Piedmont zone:** The foothill zone near the northern and eastern parts adjacent to Arunachal Pradesh
- **Active flood plains:** Near the river Brahmaputra and other major tributaries.
- **Low-Lying alluvial belt:** Covering the middle plain zone i.e., the saucer shaped built up zone, innumerable beels and swampy areas are common features.

### 1.9. Division of Silapathar Municipal Wards

The Silapathar Municipal Board till April 2015 had only 4 wards, covering a total area of 9.9 sq. km. However, after 2015 these four wards have been subdivided into 12 wards within the same municipal boundary and with a small increase in total area to 10.57 sq. km. The initial Ward 1 has been subdivided into Ward 1, 2 and 3, Ward 2 subdivided into 4, 5, and 6, Ward 3 to 7, 8, and 9 and lastly Ward 4 to subdivide into Word 10, 11 and 12 respectively as shown in **Figure 1.6**.

**Figure 1.6: Ward Maps of Silapathar, 2011 and 2022**



Source: Silapathar Municipal Board (2022), SPA, New Delhi, Primary Survey (2022).

### 1.10. Data Sources

Although Census 2011 has been taken as key source data to analyse socio-economic characteristics of the Silapathar Planning Area but to get a better understanding of the present scenario, primary surveys were conducted by the SPA New Delhi team as a part of the field visit from 21 to 31 March 2022. This included household surveys, commercial surveys, transportation surveys and land use surveys. So, apart from the census data, data from these surveys used to analyse and identify issues related to demography, housing, economy, transport, and infrastructure for the planning area of Silapathar. It is to be noted that since primary surveys were conducted in the town, the survey findings are limited to the municipal area only. Area beyond municipal limits is largely used for agricultural activities. Apart from this, secondary data was collected from the respective departments. This section gives a brief description of the data collected for the preparation of Silapathar Master Plan, 2041, from primary and secondary sources.

#### 1.10.1. Primary Sources

Primary data sources are those in which the data is collected first-hand by the researchers and surveyors for a specific purpose or project. For the preparation of Silapathar Master

Plan, the primary data was collected through household surveys, commercial surveys, transportation surveys and land use surveys

### **1. Household Surveys**

Household surveys aims to collect comprehensive and diverse socio-demographic data pertaining to conditions under which people live, their welfare, demographic characteristics, and cultural factors, that influence behaviour as well as social and economic change. In Silapathar Municipal Area, household surveys were conducted to understand the basic needs and challenges faced by the residents. A sample size of 250 households which is around five percent of the total number of households in the town was undertaken. For this, 30 households were selected randomly from each of the 12 wards. The survey questionnaire has been enclosed in Annexure I.

### **2. Commercial Surveys**

Commercial surveys were conducted in the main market areas of the town, that is, the daily market area and the Wednesday market area near the Municipal Board to understand the market conditions with respect to infrastructure, customer reach, goods import, ownership, etc. Both sellers as well as buyers were interviewed for these surveys to get a better understanding of market-related issues in the area.

### **3. Transport survey**

To analyse the current challenges with respect to traffic and transportation in the town, the following surveys were conducted.

- Road Inventory Survey to identify the major roads in the town and evaluate road characteristics in terms of right of way, carriage width, drainage, footpath, etc.
- Traffic Volume Count to find the peak hour traffic on major roads and assess their level of service.
- Parking Survey was conducted to check whether parking accumulation on main roads exceeds the existing capacity.

### **4. Land Use Survey**

Detailed land use survey was carried out for the entire municipal area to identify the residential, commercial, institutional, and industrial pockets in the town along with the major landmarks including educational, healthcare, recreational, public and semi-public facilities. The municipal area was zoned before conducting land use surveys which used to aid the preparation of an existing land use map.

### 1.10.2. Secondary Sources

Secondary data sources were data collected from census data, various offices, organisations, literature available in public domain, website and reports of Government of Assam and other authentic sources related to the development of Silapathar town. Major offices from where the secondary data collected were Municipal Board, Town and Country Planning Department, Dhemaji Development Authority and other government offices on agriculture, sericulture, handloom and textiles, industries, housing, transport, environment, forests, disaster management, employment, etc.

## **ANALYSIS OF THE SECTORS**

## CHAPTER 2: DEMOGRAPHY

### 2.1. Introduction

Population analysis is crucial for the preparation of master plans and is a useful means for analysing and predicting social, cultural and economic trends by examining size, structure and movement of the people. Since urban areas are not homogenous in nature, demographic data gives a picture of the characteristics and composition of a city's population which is a significant differentiating factor at the urban level.

This section deals with household size, number of male and female population, sex ratio particular for general and child population, literacy rate, decadal growth, population of various segments like Scheduled Caste (SC) and Scheduled Tribe Caste (ST) and its characteristics in Silapathar town.

### 2.2. Population Growth

Population growth, in general, is a measure of the increase in the number of people in an area over a given period. Decadal population growth helps to understand and project the population which assists in determining the demands for the future. Urban population has been gradually increasing since 1991 to 2011 and improvement is seen in female population in urban areas. Rapid urbanization in the district has been observed between 1991-2001, during which the growth was 336.7 percent by 2001 census (**See Table 2.1**).

**Table 2.2** shows the percentage comparison of population in detail in Silapathar town.

Table 2.1: Urban Population of Dhemaji District, 1991, 2001 and 2011

Year	Urban Population				Decadal Growth Rate in percentage
	Household	Population	Male	Female	
1991	1,895	8891	5,178	3,713	-
2001	7,872	38,832	20,769	18,063	3.3
2011	10,231	48,285	24,971	23,314	0.24

Source: Census of India, (1991, 2001, 2011).

Table 2.2: Population of Silapathar Town and Dhemaji District, 2011

Components	Silapathar Town 2011	Dhemaji District 2011	Dhemaji District in Percent
Total Population	25,662	6,86,133	3.74
Male Population	13,350	3,51,249	3.8
Female Population	12,312	3,34,884	3.68
No of Households	5,173	1,29,869	3.98

Components	Silapathar Town 2011	Dhemaji District 2011	Dhemaji District in Percent
Urban Population	25,662	48,285	53.15

Source: Census of India, Assam (2011).

### 2.3. Population Growth of Silapathar Town and Planning Area

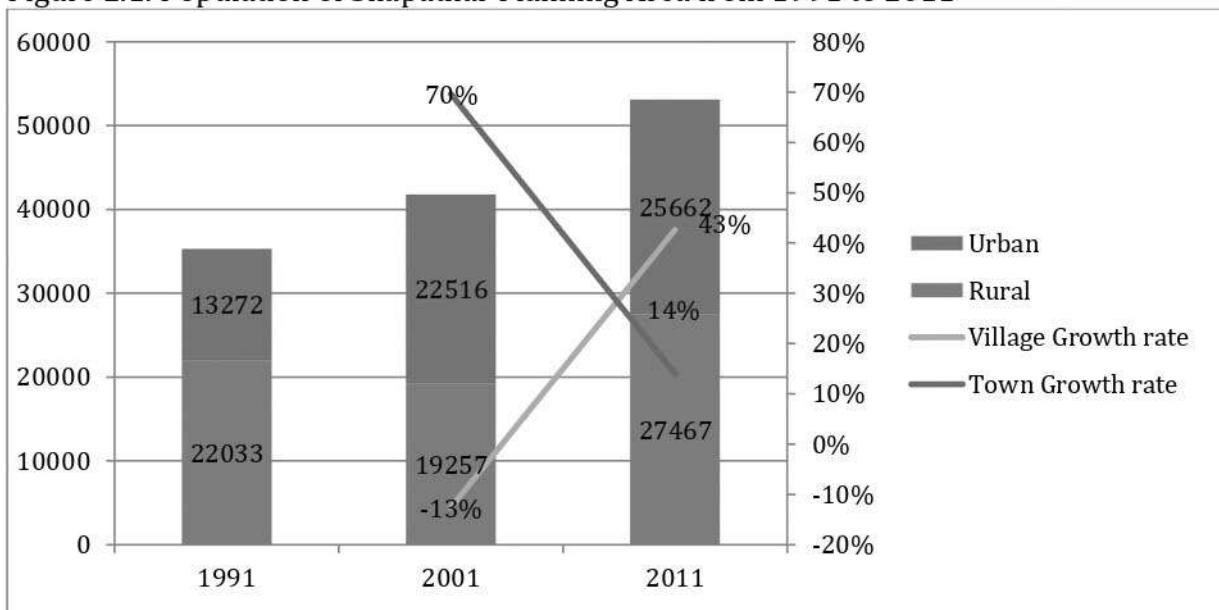
Silapathar town has evolved from a population of 13,272 in 1991, 22,516 in 2001 and 25,662 in 2011 (See Table 2.3). It is observed that the growth of population of Silapathar town has increased rapidly due to rapid development of economic activity as well as deceleration of Town Committee in the year 1997. Establishment of institutions and industries in and around the town also accelerated the rate of population growth and development prospect of the town and in the neighbouring areas of Arunachal Pradesh. Extension of railway connectivity, etc. has also contributed to the population growth in Silapathar town.

Table 2.3: Population of Silapathar Planning Area from 1991 to 2011

Year	Population				Total	Growth Rate in Percent		
	Rural		Urban					
	Number	In Percent	Number	In Percent				
1991	22,033	62.40	13,272	37.6	35,305	----		
2001	19,257	46.10	22,516	53.90	41,773	18.32		
2011	27,467	51.70	25,662	48.30	53,129	21.37		

Source: Census of India Assam (1991, 2001 and 2011).

Figure 2.1: Population of Silapathar Planning Area from 1991 to 2011



Source: Census of India, Assam (1991, 2001 and 2011).

Table 2.4: Population of Villages in Silapathar Planning Area for 2011, 2001, 1991

<b>Sl. No</b>	<b>Rural Villages</b>	<b>2011</b>	<b>2001</b>	<b>1991</b>
1	Rupahi Borgayan	438	225	334
2	Phulbari Bangali	356	221	928
3	Phulbari Pathar	257	280	220
4	No.1 Phulbari Nepali block	572	439	1,012
5	No.2 Phulbari Nepali block	616	249	239
6	Kulamua Block Part - I	1,619	1,000	580
7	Kulamua Block Part - II			
8	Akajan Bengali Gaon	245	336	277
9	Jon Gaon Nepali	168	196	107
10	Mishing Pur	329	369	572
11	Member Chuk	591	284	281
12	No.6 Borgayan Deori	218	352	123
13	Chila Gaon	1,177	862	360
14	Akajan Miri Gaon (part)	1,470	1,199	833
15	Kulamua Gaon	705	446	688
16	Kuamua Bengali Gaon	2,143	1,518	1,097
17	Kulamua Kachari Gaon	335	147	273
18	Kuamua Baruah Gaon	315	285	118
19	Gelua Gaon	219	152	160
20	No.2 Betanipam Gaon	558	121	112
21	Baratichuk	428	355	286
22	Barati Gaon	510	405	400
23	No.1 Borpathar Goahin Gaon	1,204	872	1,210
24	Rampur	837	743	516
25	Lakhipathar Lakhipur	2,063	1,638	1,306
26	Silapathar Na-Gaon	268	223	214
27	Naharani Borjan	336	282	237
28	Sarupam Jaji	2,455	1,104	749
29	Bijoypur Maduri	2,067	2,075	1,483
30	No.2 Phulbari Nepali	1,382	993	514
31	2.No Chila Gaon	1,024	693	577
32	Chila Gutung	378	61	135
33	Phulbari Asamiya	341	286	632
34	Kenduguri Samabai	7	0	422
35	Gelua Kenduguri	622	248	410
36	No.1 Chilapathar Block	5	0	2,079
37	No.2 Chilapathar Block	1,209	598	2,549
<b>Total Village Population</b>		<b>27,467</b>	<b>19,257</b>	<b>22,033</b>

Source: Census of India, Assam (1991, 2001 and 2011)

## 2.4. Silapathar Ward-wise Population

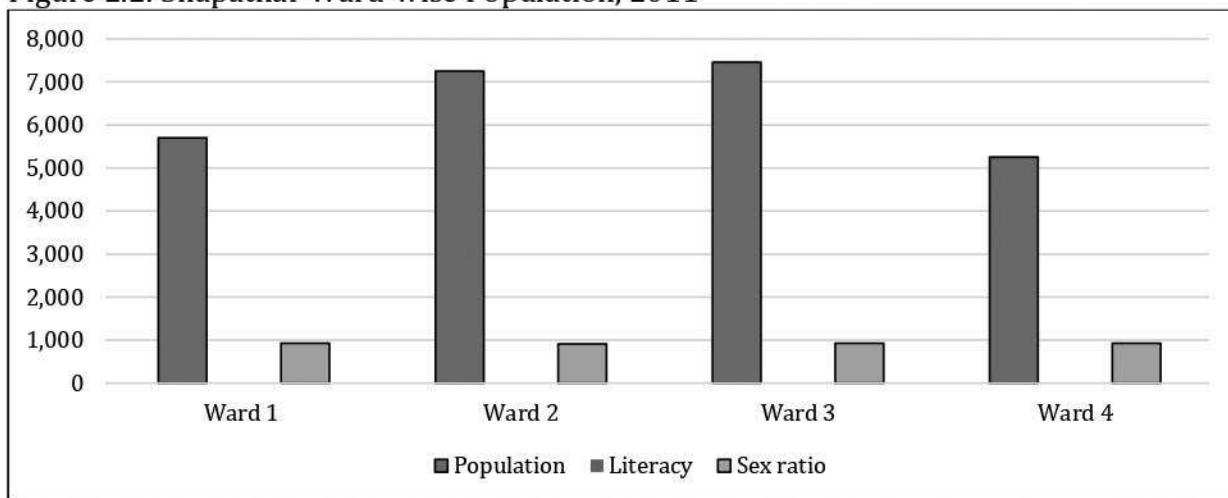
Silapathar town was formed in the year 1997 having a total of 4 wards, for which population data's have been recorded on the 4 wards till 2014. The town was further divided into 12 wards in 2015 upon the 4 wards (**See Table 2.4**).

Table 2.5: Silapathar Ward Wise Population, 2011.

Wards	Population	Literacy in Percent	Sex ratio	Area in sq. km
1.	5,698	57.50	926	2.99
2.	7,249	72.90	915	2.40
3.	7,460	80.70	925	2.48
4.	5,255	80.20	923	2.70

Source: Census of India (2011).

Figure 2.2: Silapathar Ward-wise Population, 2011



Source: Census of India (2011).

## 2.5. Household, Household Size and Density

As per the census 2011 of the Silapathar town, there are a total of 5173 HH and the average household size is 4.9. For the year 2011, the population density of the planning area is 891 persons per sq.km and that of municipal area is 2425 persons per sq.km.

Table 2.6: Density and Population of Silapathar Planning Area from 2001 to 2011

Year	Density Population per sq km	
	Municipal Area (Urban)	Planning Area (Rural)
1991	-	1502.61*
2001	-	1775.75*
2011	2425.51	995.33

\*Note: High density in 1991 and 2001 is subjective to the area of the master plan i.e., 22.93 Sq. km for both rural and urban, whereas in 2011 the planning area has increased to 53.37 Sq. km with municipal area as 10.58 Sq. km.

Source: Census of India (2001, 2011), The Assam Gazette Extraordinary (July 23, 2009).

Municipal areas for 1991 and 2001 were not demarcated since draft master plan was only prepared after 2005. **Table 2.5** shows the wards density details based on the 2022 population data collected from the Silapathar municipal board.

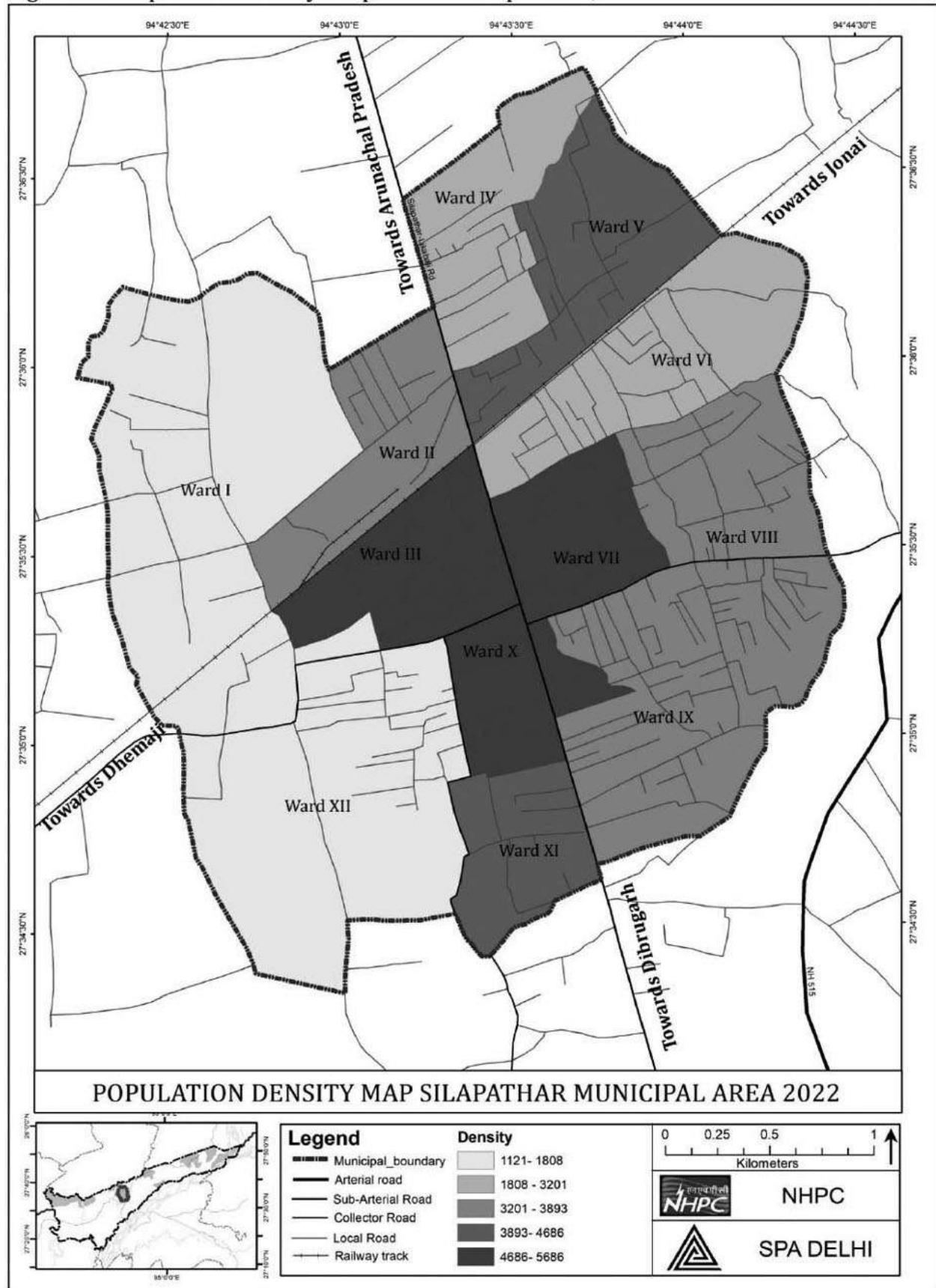
Table 2.7: Silapathar Ward Details and Density 2022.

<b>Ward No.</b>	<b>Population</b>	<b>Area in sq. km</b>	<b>Population Density (Person per Sq.km)</b>
1.	2,250	2.01	1,119
2.	2,375	0.62	3,830
3.	1,990	0.36	5,527
4.	2,000	0.65	3,076
5.	3,700	0.96	3,854
6.	2,785	0.79	3,525
7.	3,000	0.87	3,448
8.	3,750	0.57	6,578
9.	3,500	1.04	3,365
10.	2,950	0.58	5,086
11.	2,050	0.46	4,456
12.	3,002	1.66	1,808
<b>Total</b>	<b>33,352</b>	<b>10.57</b>	<b>3,155</b>

Source: Silapathar Municipal Board (2022).

As per primary data collected, it is observed that the most populated ward is in Ward 8, which caters to 3,750 people, followed by Ward 5 and Ward 9 respectively. Ward density is highest at the central of the town, since the area is small compared to the other wards and it is also the commercial centre of the town. **Figure 2.3** shows the population density distribution in the municipal area 2022.

Figure 2.3: Population Density Silapathar Municipal Area, 2022.



Source: SPA, New Delhi (2022).

## 2.6. Sex Ratio

Sex ratio is the number of females per 1,000 males in any administrative unit. In Silapathar town as per 2011 census, there are 13,350 male populations and 12,312 female populations, so female population is only 47.97 percent of the total population. Sex ratio of Silapathar town was 922 as per census 2011 which was lower than the national average of 940 in 2011. Higher sex ratio in rural areas indicates higher percentages of men migrating to the urban area for better job opportunities (**See Table 2.8**).

Table 2.8: Sex Ratio of Silapathar Planning Area, 2011.

Year	Urban			Rural		
	Male	Female	Female per 1000 males	Male	Female	Female per 1000 males
2011	13,350	12,312	922.24	8,107	7,610	1,065

Source: Census of India, Assam (2022).

## 2.7. Literacy Rate

The total literacy rate of Silapathar was 83.25 percent in 2011 which was greater than average literacy rate 72.19 percent of Assam. Out of total 18,794 literates, males were 10,307 while females were 8,487. Also, the male literacy rate was 87.72 percent and the female literacy rate was 78.39 percent in Silapathar town.

Table 2.9: Literacy Rate of Silapathar Town, 2011

	Total Population	Number of Literates	No of Illiterates	Literacy rate in Percent	Literacy rate of Assam in Percent
Person	25,662	18,794	6,868	83.25	66.27
Male	13,350	10,307	1,973	87.72	77.85
Female	12,312	8,487	3,825	78.39	72.19

Source: Census of India, Assam (2011)

## 2.8. Religion

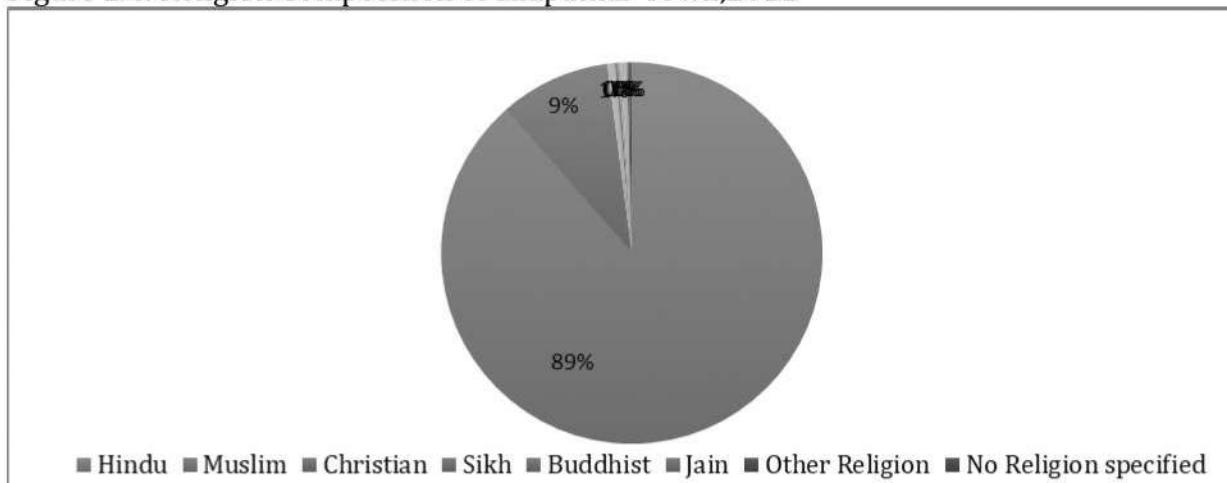
Silapathar town has a diverse composition of religion with the Hindu religion having the highest percentage of 88.48 percent followed by Muslim 9.46 percent, Christian 0.63 percent, Sikh 0.26 percent, Buddhist 0.22 percent, Jain 0.54 percent, other religion 0.14 percent and lastly no religion specified is 0.26 percent. **Table 2.10** and **Figure 2.4** show the detail of the composition of religion in the town.

Table 2.10: Religion Composition of Silapathar Town, 2011

<b>Religion</b>	<b>Total</b>	<b>Percent</b>	<b>Male</b>	<b>Female</b>
<b>Hindu</b>	22,706	88.48	11,816	10,890
<b>Muslim</b>	2,427	9.46	1,270	1,157
<b>Christian</b>	162	0.63	84	78
<b>Sikh</b>	67	0.26	35	32
<b>Buddhist</b>	57	0.22	31	26
<b>Jain</b>	139	0.54	68	71
<b>Other Religion</b>	37	0.14	18	19
<b>No Religion Specified</b>	67	0.26	28	39

Source: Census of India (2011).

Figure 2.4: Religion Composition of Silapathar Town, 2011



Source: Census of India (2011).

## 2.9. Conclusions

Since Silapathar municipal board was established in 1997. The details of population and ward-wise population were not available for the census year 1991. The town has evolved from a population of 13,272 in 1991, 22,516 in 2001 and 25,662 in 2011. It is observed that the growth of the town has increased rapidly due to rapid development of economic activity as well as deceleration of Town Committee in the year 1997. The 4 municipal wards have further been expanded to 12 wards after 2015. Each of the previous 4 wards have further been subdivided in three wards respectively. Sex ratio of the town in the year 2011 was 922 which were lower than the national average of 940. The total literacy rate of Silapathar was 83.25 percent in 2011 which is greater than the average literacy rate 72.19 percent of Assam which shows progress in the education system in the town. In terms of religion status Hindu religion has the highest share of 88.48 percent followed by Muslim 9.46 percent and Christian 0.63 percent as per the census, in Silapathar.

## CHAPTER 3: HOUSING

### 3.1. Introduction

The housing sector in the preparation of a Master plan, is a crucial integral part of the preparation process since it ensures that each person in the town has a liveable housing with basic necessary amenities and infrastructure facilities. Housing entails more than just a building, it implies creating a safe liveable neighbourhood with essential utilities such as access to good weather roads, water supply, proper drainage, sanitation, social amenities etc. The details of housing such as number of houses, type of house such as residential, residential cum other uses as defined in census 2011 are discussed and analysed in this chapter. In addition to this the conditions of such houses as per usability in terms of qualitative measures have been discussed. The condition refers to the living quality of houses which includes good, liveable and dilapidated condition of these discussed houses.

### 3.2. Housing Typology

Housing typology in Assam has a distinct style which is commonly known as the Assam type house, where the roofs are slanted to shade the rain water during the monsoons. These Assam houses are designed and constructed by using locally available materials like bamboo, mud, hatch etc, which suits the climatic condition of the region. Since the area is prone to seasonal flood and earthquakes, it employs a building construction technique which proves to be resilient to disaster. Traditionally people have been residing in the Assam type houses made of the raw materials but due to increase in population and urbanisation there has been unrestricted growth of RCC building and multi storeyed structures to accommodate the increase population in a given plot of land.

#### 3.2.1. Ikra House

The Ikra house, also known as the "Assam type house," is found throughout northeast India. Typically, low weight locally accessible materials such as bamboo, wooden planks. Ikra houses are single storied with brick or stone masonry walls that extend up to about one metre above the plinth. This masonry supports the walls consisting of bamboo woven together with a wooden frame and plastered with cement or mud plaster. The roof is often made up of GI sheets supported by wood or bamboo trusses that link the parallel walls

laterally. These houses are particularly resistant to earthquakes. Figure 4.1 shows an Assam type 'Ikra' house in Dhemaji.

### 3.2.2. Chang house

This type of house is raised on stilts and is primarily constructed in areas of heavy vegetation, forest, and riverbanks. People from Assam's Mising community traditionally reside in stilted houses which have religious and social beliefs and traditions associated to them. A flight of 5 to 7 stairs leads to the entrance of these houses. For a large joint family, the house on stilts is a wide hall with a central kitchen.

### 3.2.3. Bamboo House

In this housing system, bamboo is used as the principal structural member. Brick wall is used for modelling. It is also inextricably linked to the plinth as well as the bamboo. The wall in this system is built of bamboo strips and coated with mud. The house's roof is made of local grass and can survive up to ten years before needing to be replaced. The house's stilts section is designed to protect it from minor floods. Figure 4.2 shows a bamboo house in Silapathar.

## 3.3. Housing Condition

### 3.3.1. Housing Condition in Silapathar Town

The state of structural stability of a house is referred to as its housing condition. According to the Census of India, 'good' housing condition indicates the house needs no repairs, 'liveable' means the house needs minimal repairs, and 'dilapidated' implies the house needs extensive repairs or reconstruction, or houses that have rotted or damaged and are far from being restored or rebuilt. As per 2011 census, there are total of 5,173 household with a household size of 4.9. There are two types of usage, first is residential purpose in which most of the houses comes under these uses (98 percent) while 2 percent houses are under residential cum other uses in the town.

Table 3.1: Housing Characteristics of Silapathar Town, 2011.

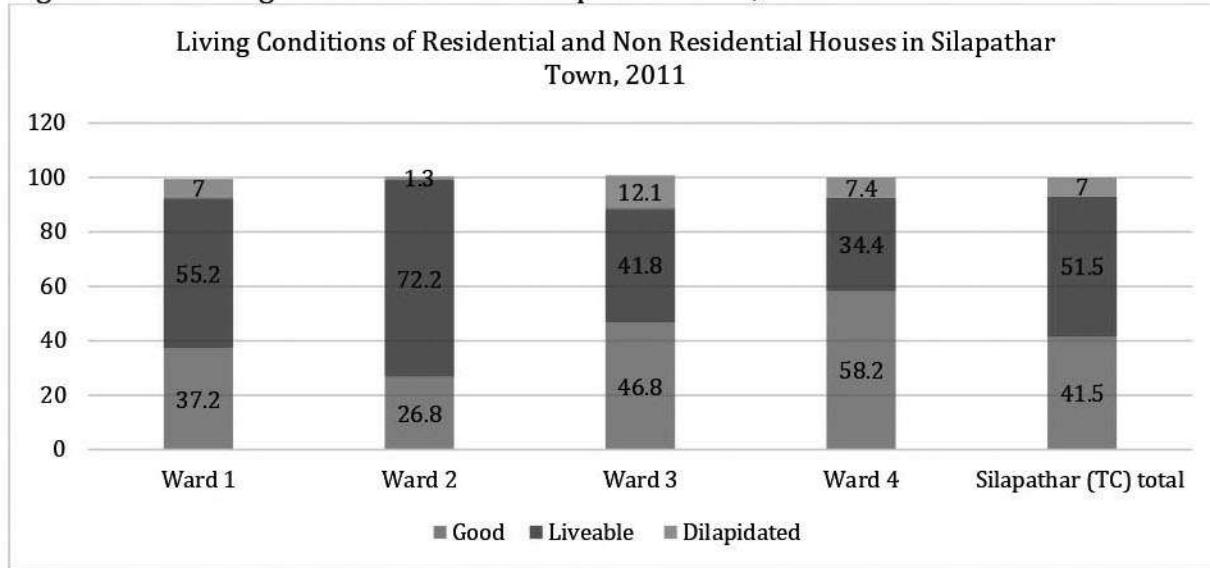
Area Name	Conditions and Uses of House in Percent of Total Houses											
	Total				Residence				Residence Cum Other Use			
	Total	Good	Livable	Dilapidated	Total	Good	Livable	Dilapidated	Total	Good	Livable	Dilapidated
<b>Ward 1</b>	100	37.2	55.2	7.0	97.5	36.5	54.0	7.0	2.5	1.3	1.2	0
<b>Ward 2</b>	100	26.8	72.2	1.3	98.3	25.6	71.5	1.2	1.7	0.9	0.8	0.1
<b>Ward 3</b>	100	46.8	41.8	12.1	98.3	45.5	40.8	12.1	1.7	0.7	2.0	0
<b>Ward 4</b>	100	58.2	34.4	7.4	57.5	57.5	33.2	7.2	2.0	0.6	1.2	0.2
<b>Total</b>	100	41.5	51.5	7.0	98	40.6	50.5	6.9	2.0	0.9	1	0.1

Source: Census of India, Assam (2011).

As per the 2011 census (see **Table 3.1**), it is observed that 41.5 percent of the houses are in good condition, with 51.5 percent houses in liveable conditions and 7 percent in dilapidated condition. From the total houses, used only for residential purpose, 40.6 percent are in good condition, 50.5 percent in liveable condition and 6.9 percent in dilapidated condition, which implies that the housing scenario in the town is moderate. Residence cum other uses has a total of 2 percent from the entire housing where 0.9 percent are in good condition, 1 percent in liveable and the rest 0.1 dilapidated condition.

Ward level analysis of all type of uses including residential and other uses, shows that highest number of good quality of houses are in ward No. 4 with 58.2 percent followed by ward No. 3 with 46.8 percent, Ward 1 with 37.2 percent and least in Ward 2 with 26.8 percent. Details on liveable and dilapidated conditions of houses are shown in **Figure 3.1**.

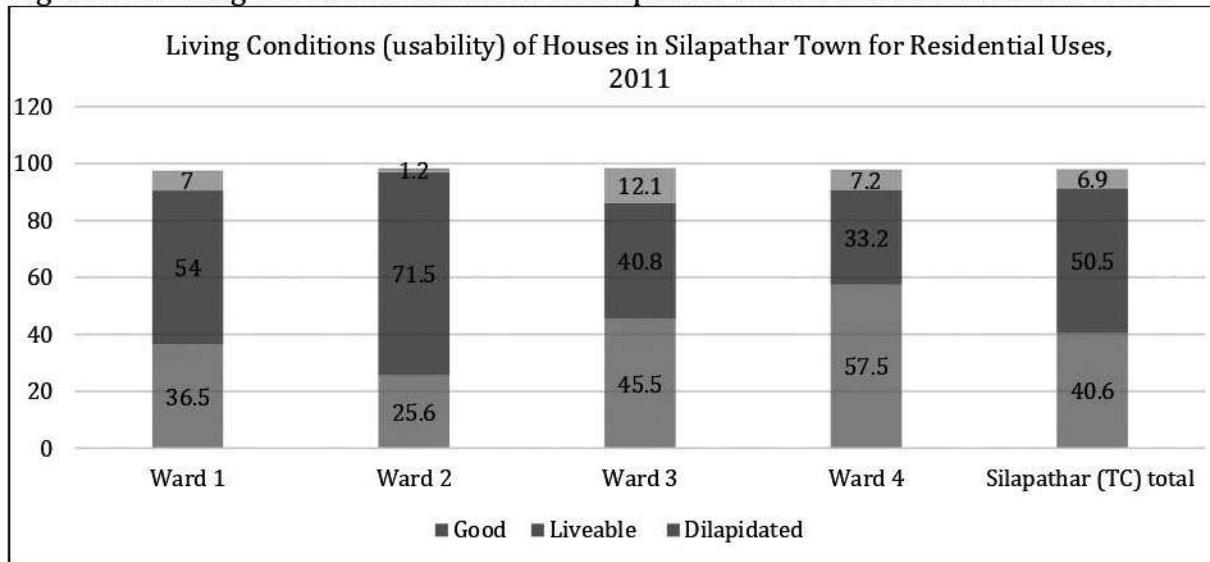
Figure 3.1: Housing Characteristics of Silapathar Town, 2011



Source: Census of India, Assam (2011).

As far as living condition, about 40.6 percent houses of residential uses in the town are in good condition followed by 50.5 percent in liveable conditions and 6.9 percent in dilapidated conditions. Ward level analysis shows that about 57.5 percent of good qualities of houses are in Ward 4 followed by Ward 3 with 45.5 percent, Ward 1 with 36.5 percent and 25.6 percent in Ward 2. Details on liveable and dilapidated conditions of houses are shown in **Figure 3.2**.

Figure 3.2: Living Conditions of Houses in Silapathar Town for Residential uses 2011.

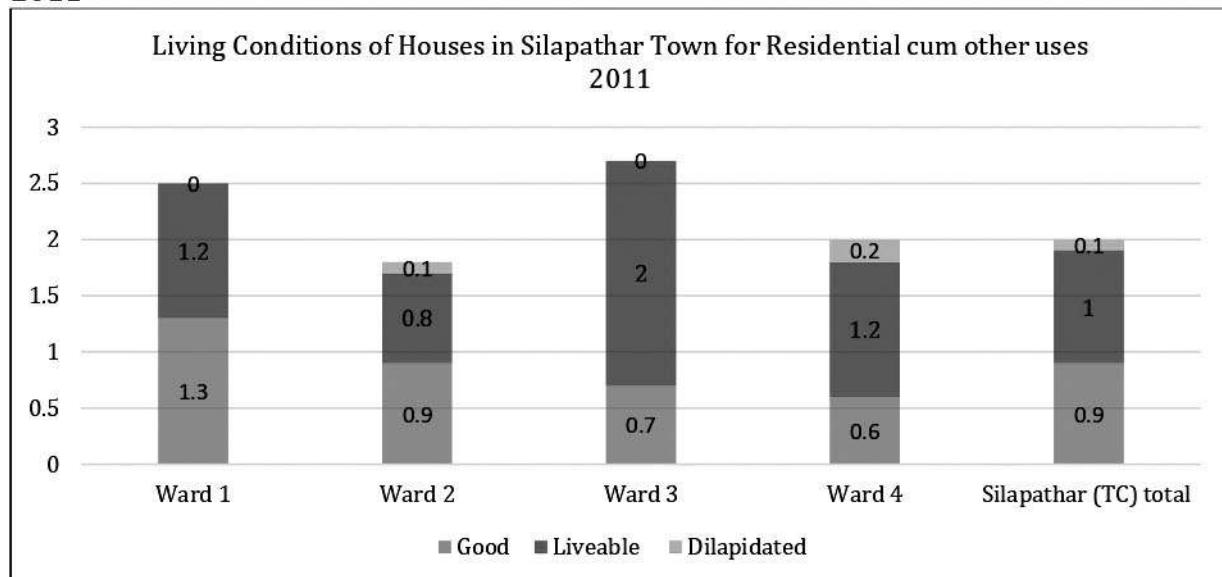


Source: Census of India, Assam (2011).

Ward wise details for residential cum other usage shows that ward no. 3 has the highest percentage of liveable houses of 3 percent, followed by ward no. 1 and 4 with 1.2 percent

and lastly ward no. 2 with 0.8 percent. Though the percentage share of the residential cum other uses is less, majority of the houses are in good condition (see **Figure 3.3**).

**Figure 3.3: Living Conditions of Houses in Silapathar Town for Residential Cum Other Uses, 2011**

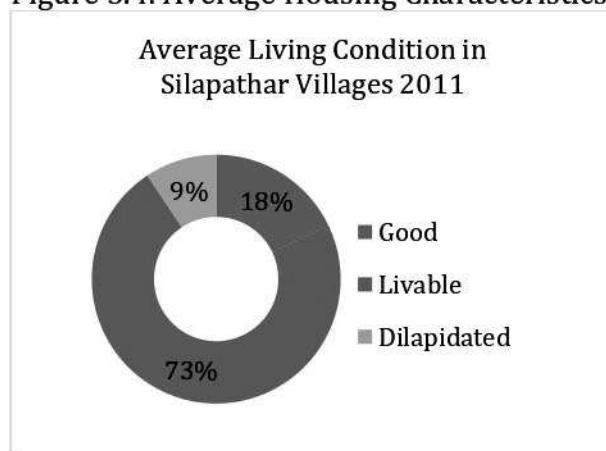


Source: Census of India, Assam (2011).

### 3.3.2. Housing Condition in Silapathar Villages

From the Census 2011 it is observed that within the planning area, in an average 18 percent of the houses are in good condition, 73 percent of the houses are in liveable condition and the remaining 9 percent of the houses are in dilapidated condition (see **Figure 3.4**)

**Figure 3.4: Average Housing Characteristics of Silapathar Villages, 2011**



Source: Census of India, Assam (2011).

The detailed village number of households with condition of census house as per census 2011 is given below in **Table 3.2** and **Figure 3.5**.

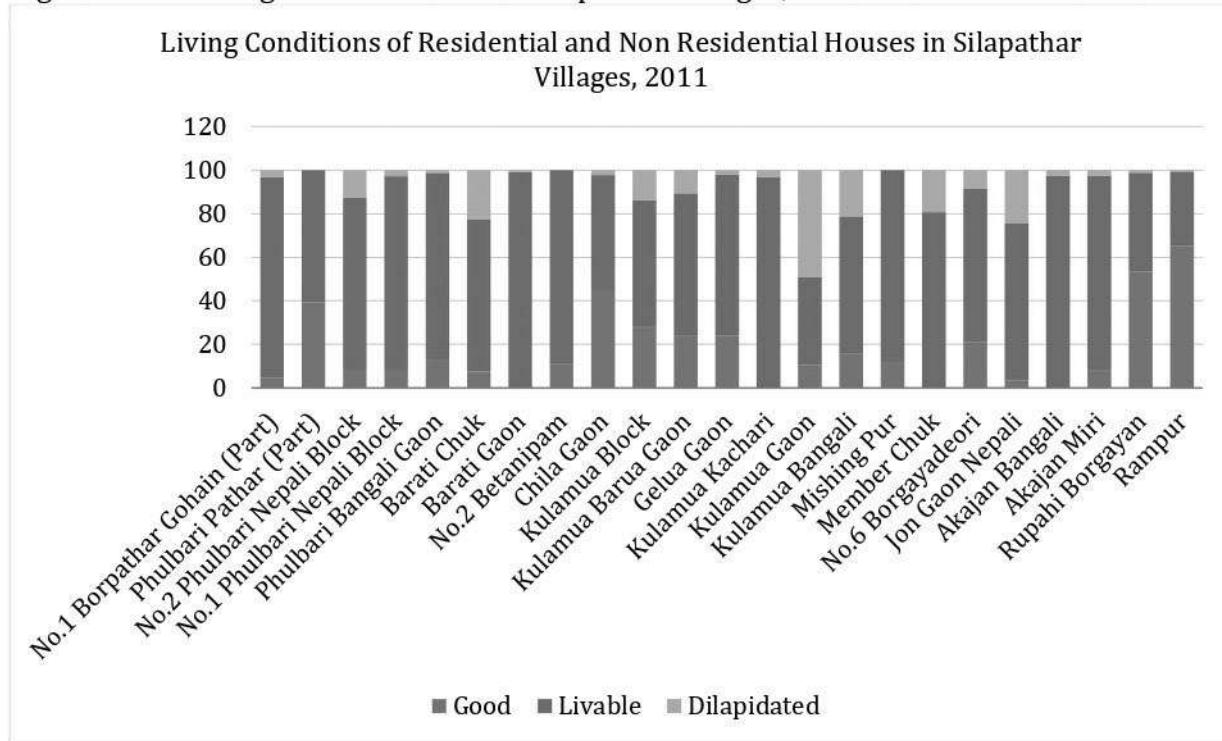
Table 3.2: Housing Characteristics of Silapathar Villages, 2011

Village Name	Number of Households with Condition of Census House											
	Total				Residence				Residence-cum-other use			
	Total	Good	Livable	Dilapidated	Total	Good	Livable	Dilapidated	Total	Good	Livable	Dilapidated
No.1 Borpathar Gohain (Part)	100	4.6	92.1	3.3	99.2	4.6	91.2	3.3	0.8	0	0.8	0
Phulbari Pathar (Part)	100	39.3	60.7	0	100	39.3	60.7	0	0	0	0	0
No.2 Phulbari Nepali Block	100	8.5	78.8	12.7	98.3	8.5	77.1	12.7	1.7	0	1.7	0
No.1 Phulbari Nepali Block	100	8.4	88.8	2.8	99.1	7.5	88.8	2.8	0.9	0.9	0	0
Phulbari Bangali Gaon	100	13.8	84.6	1.5	100	13.8	84.6	1.5	0	0	0	0
Barati Chuk	100	7.5	70	22.5	98.8	7.5	68.8	22.5	1.2	0	1.2	0
Barati Gaon	100	0	99	1	100	0	99	1	0	0	0	0
No.2 Betanipam	100	11.2	88.8	0	98.3	11.2	87.1	0	1.7	0	1.7	0
Chila Gaon	100	44.9	52.9	2.2	99.6	44.9	52.4	2.2	0.4	0	0.4	0
Kulamua Block	100	29.1	57.2	13.7	99	29.1	56.2	13.7	1	0	1	0
Kulamua Barua Gaon	100	24.2	65.2	10.6	100	24.2	65.2	10.6	0	0	0	0
Gelua Gaon	100	24	74	2	100	24	74	2	0	0	0	0
Kulamua Kachari	100	0	96.9	3.1	100	0	96.9	3.1	0	0	0	0
Kulamua Gaon	100	10.5	40.3	49.2	100	10.5	40.3	49.2	0	0	0	0
Kulamua Bangali	100	15.9	62.8	21.3	98.7	15.9	61.8	21	1.3	0	1	0.3

Village Name	Number of Households with Condition of Census House											
	Total				Residence				Residence-cum-other use			
	Total	Good	Livable	Dilapidated	Total	Good	Livable	Dilapidated	Total	Good	Livable	Dilapidated
Mishing Pur	100	12.5	87.5	0	98.2	12.5	85.7	0	1.8	0	1.8	0
Member Chuk	100	0	80.6	19.4	100	0	80.6	19.4	0	0	0	0
No.6 Borgayadeori	100	21.3	70.2	8.5	100	21.3	70.2	8.5	0	0	0	0
Jon Gaon Nepali	100	3.4	72.4	24.1	100	3.4	72.4	24.1	0	0	0	0
Akajan Bangali	100	0	97.5	2.5	100	0	97.5	2.5	0	0	0	0
Akajan Miri	100	9	88.5	2.5	99.6	9	88.1	2.5	0.4	0	0.4	0
Rupahi Borgayan	100	53.5	45.3	1.2	100	53.5	45.3	1.2	0	0	0	0
Rampur	100	65.3	34	0.7	100	65.3	34	0.7	0	0	0	0

Source: Census of India, Assam (2011).

Figure 3.5: Housing Characteristics of Silapathar Villages, 2011



Source: Census of India, Assam (2011).

### 3.4. Housing structure

As per the census of India, houses can be classified into three categories based on their structural strength. These are permanent, semi-permanent and temporary. Permanent houses are the structures with wall and roof made of permanent materials such as G.I., stone, metal, asbestos sheets, burnt bricks and concrete. Temporary structures have walls and roof made of temporary material such as grass, thatch, bamboo, plastic, polythene, mud, unburnt bricks or wood. In semi-permanent structures, either wall or roof is made of permanent material and the other is made of temporary material. **Table 3.3** shows that the total percentage of permanent housing in the planning area is 9.71 percent with 62.44 percent semi-permanent and 27.77 percent temporary. Within the municipal area 31.3 percent have permanent houses, 55.9 percent semi-permanent and 12.6 temporary. The relatively higher percentage of temporary houses in the rural areas is because of the use of temporary raw materials like mud and bamboos for constructing the houses.

Table 3.3: Structural Typology of Housing in Silapathar Planning Area, 2011

Type of Structures	Urban in Percent	Rural in Percent	Planning Area in Percent
Permanent	31.4	8.8	9.7
Semi-Permanent	55.9	62.7	62.5
Temporary	12.7	28.5	27.8
Total	100.0	100.0	100.0

Source: Census of India, Assam (2022)

#### 3.4.1. Housing Structure in Silapathar Town

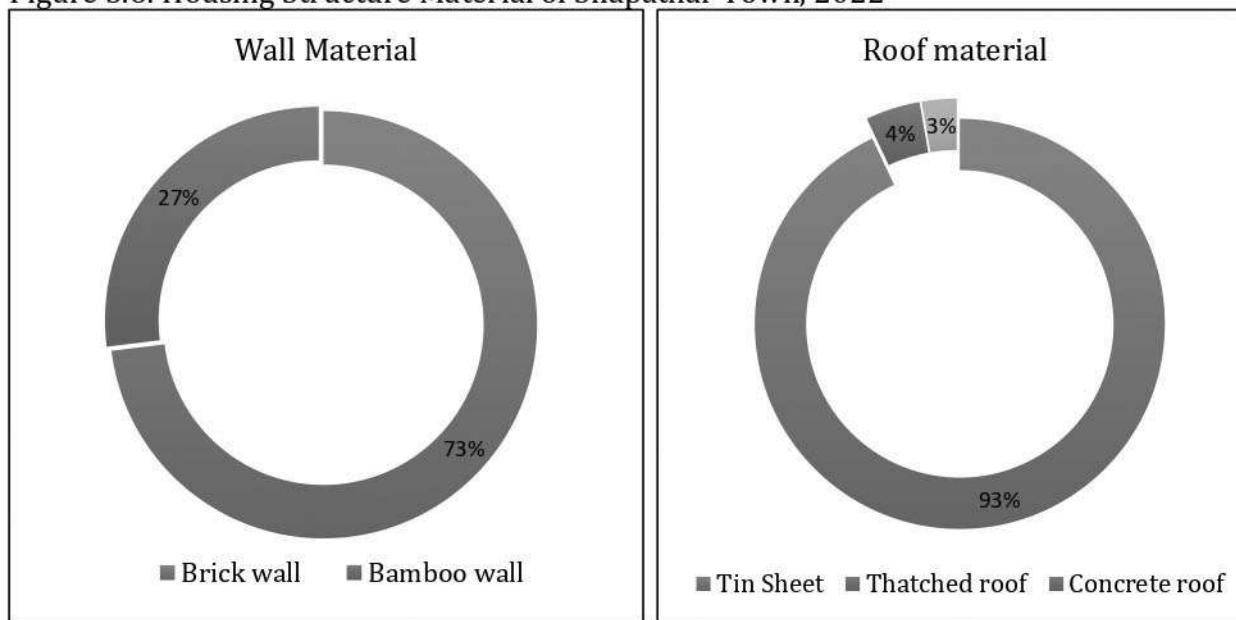
Team from SPA New Delhi had also conducted a field survey on the month of March 2022, where household surveys were conducted based on 5 percent of the total household which were a total of 250 samples. Surveys were conducted on all the 12 wards with 20 samples collected from each ward. **Table 3.4** shows the data representation of the type of housing structure from the Silapathar municipal area 2022.

Table 3.4: Housing structure material of Silapathar town, 2022.

Sl. No.	Wall Material	Samples	Percent
1.	Brick wall	187	73.82
2.	Bamboo wall	69	26.95
Sl. No.	Roof Material	Samples	Percent
1.	Tin Sheet	238	92.96
2.	Thatched roof	11	4.29
3.	Concrete roof	7	2.73

Source: SPA New Delhi, primary survey (2022).

Figure 3.6: Housing Structure Material of Silapathar Town, 2022



Source: SPA New Delhi, Primary survey (2022)

As per the survey conducted it is observed that most of the houses were permanent having brick walls and tin sheets. Most of these structures were seen in and around near the commercial area and the semi-permanent structures that were constructed of bamboo walls and thatched were seen mostly around the outskirts of the town and some around the corners of the town. Overall, at present, the housing condition of the town seems to be at a moderate condition.

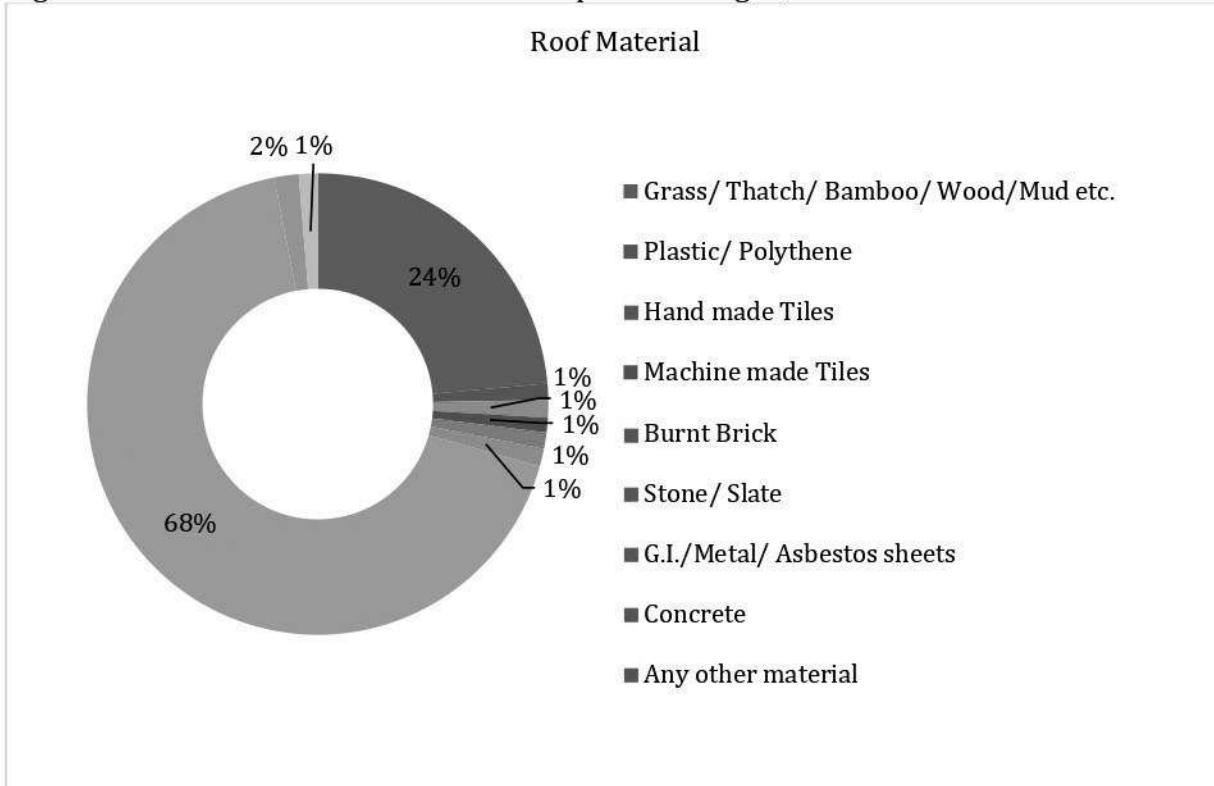
### 3.4.2. Housing Structure in Silapathar Villages

As per Census 2011, the roof, wall, and floor materials of the houses in Silapathar villages are being analysed. It is observed that most of the houses i.e., 68 percent have asbestos roof and 24 percent have grass, thatch, or bamboo roof. Whereas houses with concrete roofs accounts to only 2 percent (see **Figure 3.7**).

80 percent of the houses have walls of grass, thatch, or bamboo and only 9 percent have burnt bricks as wall materials (see **Figure 3.8**). This indicates that most of the houses are prone to disaster.

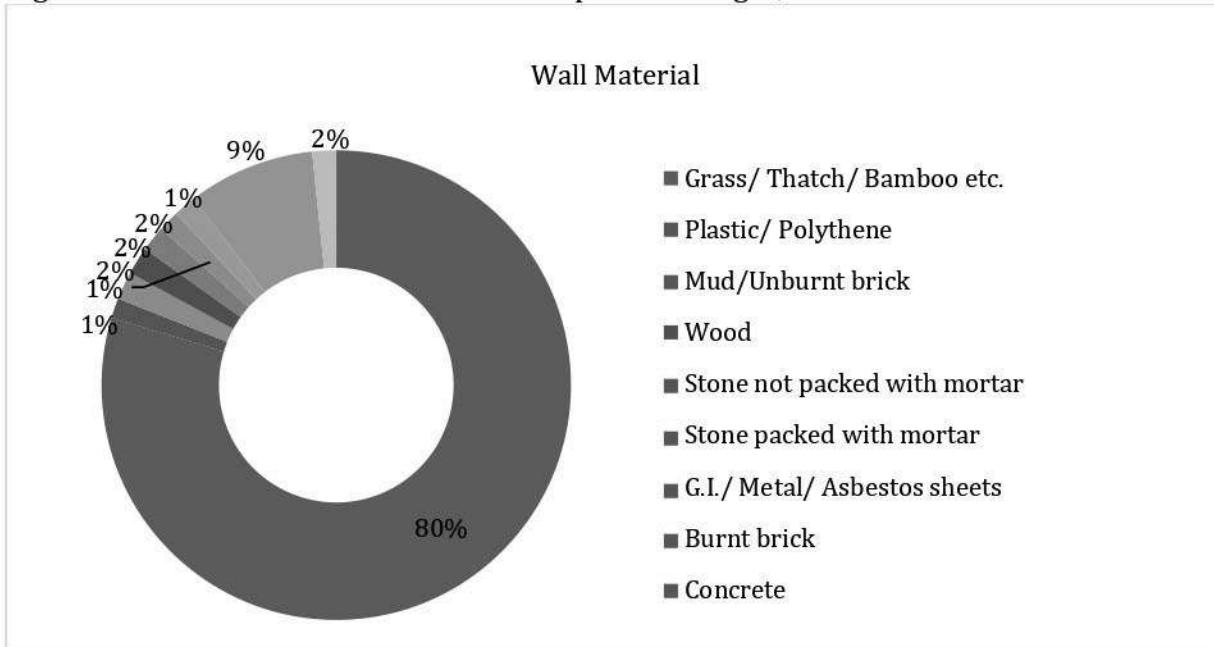
In case of floor materials, 71 percent of the houses have mud floors with 11 percent of the houses having cement floors (see **Figure 3.9**).

Figure 3.7: Roof Material in Houses of Silapathar Villages, 2011



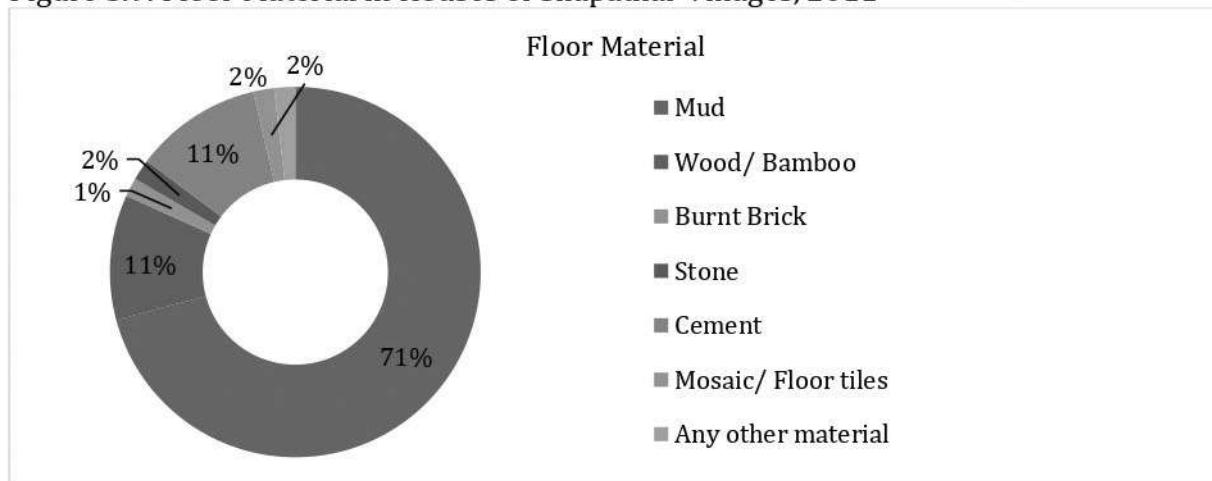
Source: Census of India, (2011).

Figure 3.8: Wall Material in Houses of Silapathar Villages, 2011



Source: Census of India, (2011).

Figure 3.9: Floor Material in Houses of Silapathar Villages, 2011



Source: Census of India, (2011).

### 3.5. Housing ownership

Housing ownership status indicates the percentage of house owned and house rented in the town. In Silapathar Planning Area, 97.30 percent of houses are owned, and 1.74 percent are rented as stated in **Table 3.5**. In the urban area, the share of owned houses is 81.9 percent, while in the rural areas, it is 98.19 percent. This is because property rates are relatively less in villages and therefore, people prefer to purchase an accommodation, or a plot of land, instead of paying rent. However, the urban population includes a significant number of migrants who work there and are willing to stay in a rental accommodation.

Table 3.5: Ownership Status of Houses in Silapathar Planning Area, 2011

Ownership Status	Urban in Percent	Rural in Percent	Planning Area in Percent
Owned	81.90	98.19	97.3
Rented	15.90	1.21	1.74
Others	2.20	0.58	0.94

Source: Census of India, Assam (2022).

As per survey conducted by the SPA New Delhi team 2022, it is analysed that 94 percent of the houses in the municipal area are owned and only 6 percent are rented. The increase in the ownership of the houses over the last one decade indicates that the ownership has improved. Rents for the houses as per survey shows that, house rents ranges from 600-4000 based on the location of the place. **Figure 3.10** shows the ownership status of Municipal Area and village area 2022.

Figure 3.10: House Ownership Silapathar



Source: SPA New Delhi, Primary Survey (2022) and Census of India, (2011).

### 3.6. Household size

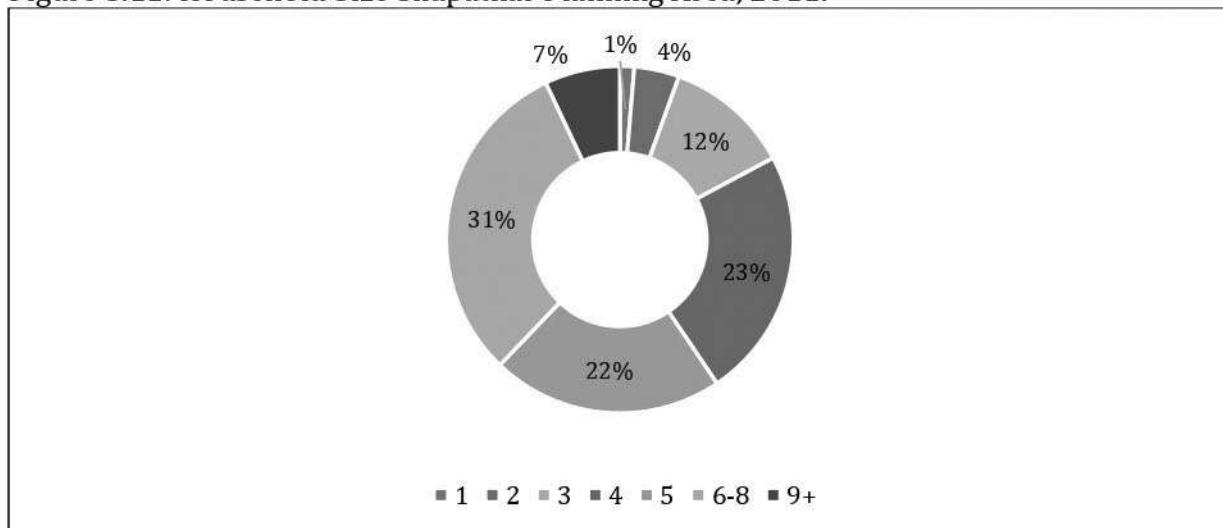
Household size is defined as the ratio of the total population to the total number of households. As per 2011 census the maximum household size is 6-8 people per household in the planning area (see **Table 3.6**). The average household size for the rural area is and for urban are 4.9. **Figure 3.11** below shows the number of households based on a particular household size within Silapathar planning area.

Table 3.6: Household Size in Silapathar Planning Area, 2011

Household Size	Urban in Percent	Rural in Percent	Planning Area in Percent
1	2.4	1.29	1.33
2	5.2	4.15	4.2
3	13.1	11.61	11.67
4	24.8	23.27	23.34
5	21.9	21.58	21.6
6-8	27.4	30.96	30.81
9+	5.1	7.1	7.02

Source: Census of India, Assam (2022)

Figure 3.11: Household Size Silapathar Planning Area, 2011.

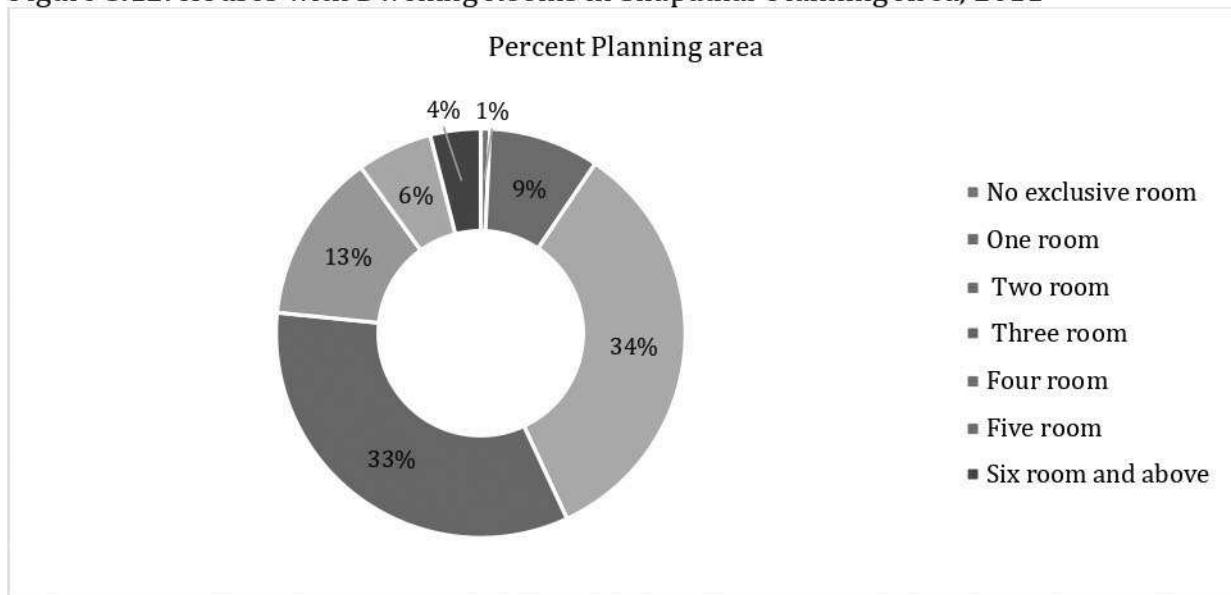


Source: SPA New Delhi, (2022)

### 3.7. Dwelling Rooms

As per census, dwelling rooms are the habitable rooms in a household. According to the census 2011, the average dwelling room in the Silapathar Planning area is three rooms which has an overall share of 34 percent. **Figure 3.12** shows the percent of houses with certain no of dwelling rooms within the Silapathar planning area. **Table 3.7** shows the percent of houses with dwelling rooms with more than six is 6.3 percent in the urban area and 3.85 percent in the rural area.

Figure 3.12: Houses with Dwelling Rooms in Silapathar Planning Area, 2011



Source: Census of India, Assam (2011).

Table 3.7: Number of Dwelling Rooms in Houses in Silapathar Planning Area, 2011.

Dwelling Rooms	Urban in Percent	Rural in Percent	Planning Area Percent
No exclusive room	0.9	0.72	0.73
One room	14.8	8.40	8.67
Two room	31.5	33.53	33.44
Three room	26.0	33.68	33.36
Four room	13.7	13.86	13.36
Five room	6.9	5.91	5.95
Six room and above	6.3	3.85	3.95

Source: SPA New Delhi (2022).

In urban area (municipal) maximum percentage of dwelling room is two rooms of 31.5 percent followed by three rooms of 26 percent whereas in the rural areas three rooms are the maximum dwelling rooms per household followed by two rooms of 33.53 percent. Percentage of the three dwelling rooms is slightly higher in the rural areas because of the availability of space and cheaper cost of land as compared to the urban area.

### 3.8. Housing provision

The Pradhan Mantri Awas Yojana (PMAY)(URBAN)-Housing which launched by the Government of India in 2015 is a flagship mission which aims in boosting the home ownership in the country. Its main aim is at achieving "Housing for all" by the year 2022. In Silapathar town, a total of 80 houses have been constructed so far under PMAY-U and another 48 are under construction as per the report submitted by the Silapathar Municipal Board as of April 2022. The stagewise physical status of houses under PMAY-U in Silapathar town is shown in Table 3.8.

Table 3.8: Houses under Pradhan Mantri Awas Yojana in Silapathar Municipal area.

DPRs	Total Beneficiaries /Target	No of Beneficiaries Fund Received			Stage Wise Physical Status of Construction as on 18/04/2022					
		1st instalment	2nd instalment	3rd instalment	Not started	Total House under construction	Foundation	Lintel	Roof	Completed
1st DPR	59									
2nd DPR	33	128	106	43	0	48	12	24	12	80
3rd DPR	41									
Total	133									

Source: Silapathar municipal board (2022)

### 3.9. Conclusions

In the Silapathar planning area most of the houses are temporary structure which is made of raw material like bamboo and mud, since they are cheap and easily available. These houses in the rural areas are resistant and adaptive to climate conditions, but harsh seasonal weather condition may hamper the living condition of the rural livelihood. Housing conditions in the municipal area are in good liveable conditions; however some wards need special attention since they are in a dilapidated condition. Overall, around 7 percent of the entire houses in the municipal area are in a dilapidated condition, for which these structures need to be renovated to improve their condition since they are worst affected during monsoon season. Provision of housing under PMAY-U also needs to introduce in more beneficiaries to meet the needs of the housing demand in the future.

## CHAPTER 4: TRADE, COMMERCE AND ECONOMY

### 4.1. Introduction

Economic activities are also important drivers of growth. The chapter aims to foster the economy of the city through various interventions in terms of space and policy over time. Such growth in economic activities can lead to increased productive employment that is increases in employment and increases in labour productivity. This can further uplift the socio-economic conditions of the citizens.

Silapathar town is one of the rising commercial centres of the district of Dhemaji, with neighbouring towns like Dhemaji town, Jonai town and the district of Arunachal Pradesh depending on the town for certain commodities. The town offers a variety of options of commercial commodities starting from car services to electronics within the town, which has the potential to grow bigger given the development of the town that is along a linear pattern making it a suitable choice for commercial planning. Rice, wheat, and handloom are some of the major products in the town.

### 4.2. Workers Characteristics

As per 2011 census there were a total of 7,820 workers in Silapathar town which accounts only 30.5 percent of the total population. Total male workers were 6,704 which accounts around 50 percent of the male population, while female workers were only 1,116 which accounts to only 9.1 percent of the total female population (**See Table 4.1**).

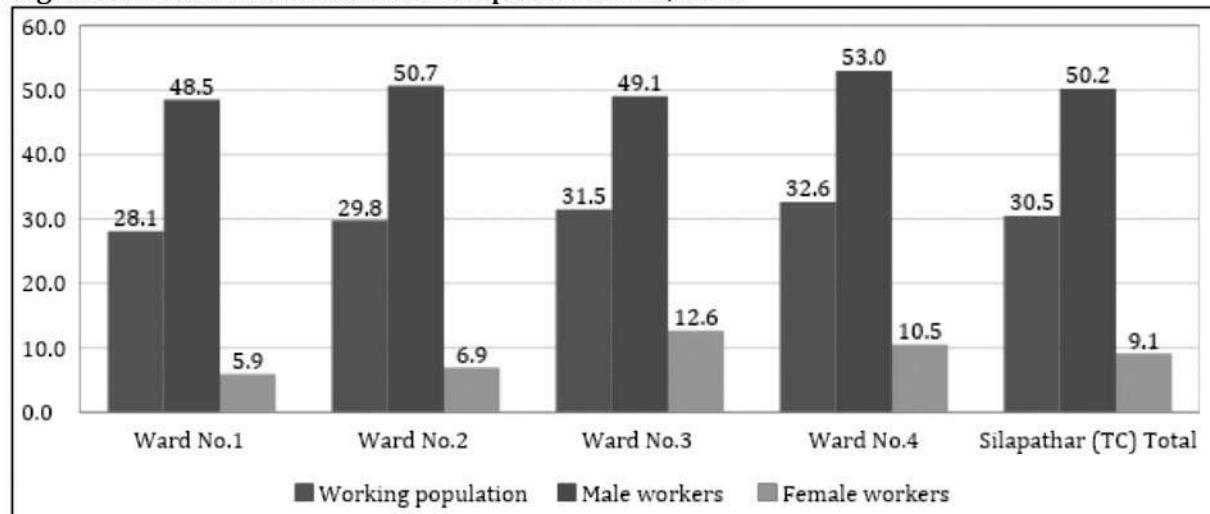
Table 4.1: Working Population in Silapathar Town, 2011

Wards	Total Population	Male Population	Female population	Working population	Percent share	Male workers	Percent share	Female workers	Percent share
<b>Ward 1</b>	5,698	2,958	2,740	1,599	28.1	1,436	48.5	163	5.9
<b>Ward 2</b>	7,249	3,785	3,464	2,159	29.8	1,920	50.7	239	6.9
<b>Ward 3</b>	7,460	3,875	3,585	2,351	31.5	1,901	49.1	450	12.6
<b>Ward 4</b>	5,255	2,732	2,523	1,711	32.6	1,447	53.0	264	10.5
<b>Total</b>	25,662	13,350	12,312	7,820	30.5	6,704	50.2	1,116	9.1

Source: Census of India (2011).

As per the census report 2011, although there is an increase in the workforce population, the ratio of the workforce of the male to female is very low for which there should be more focus considering the employment of female workers in the industries for equal employment generation. In the ward level analysis Ward 3 produces the most numbers of workers both for male and female and Ward 1 is the least.

**Figure 4.1: Share of Workers in Silapathar Town, 2011**



Source: Census of India (2011).

In the ward level analysis, Ward 3 has the highest number of workers (32.6 percent) while Ward 1 with the least (28.1 percent). In terms of gender wise workforce, Ward 4 has the highest male workers of 32.6 percent while Ward 1 has the lowest of 48.5 percent. Female workers are highest in Ward 3 (12.6 percent) and lowest in Ward 1(5.9 percent). In Silapathar town, the total workforce population as per 2011 census was around 31 percent with male workers accounting to 50 percent and female workers to 9 percent (**See Figure 4.1**).

**Table 4.2: Main and Marginal Workers in Silapathar Planning Area, 2011**

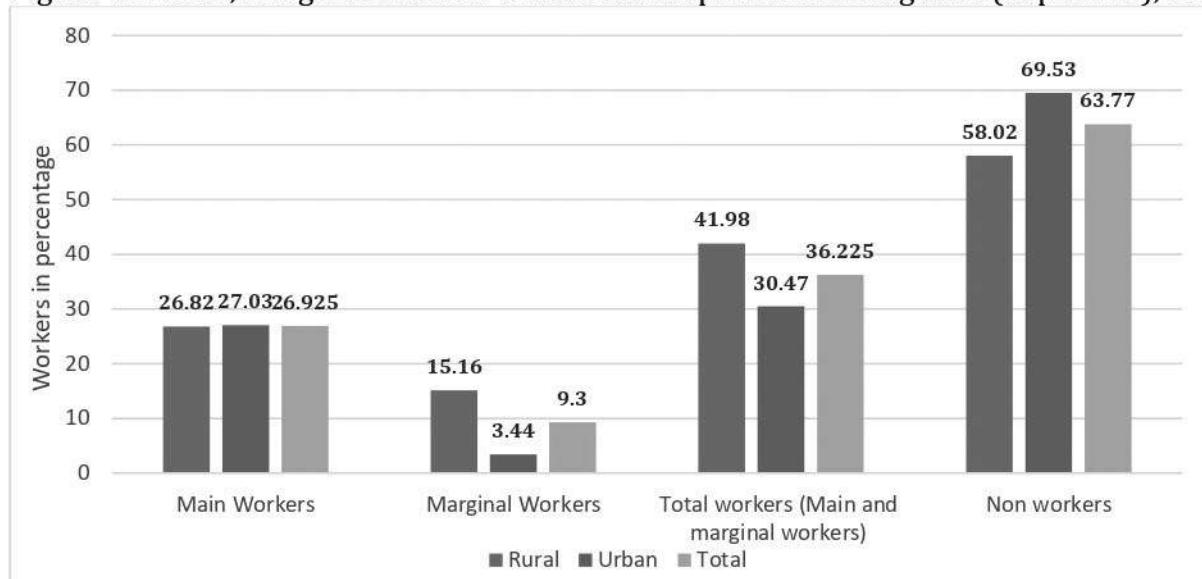
Area	Total Population	Main workers		Marginal workers		Total workers (Main and marginal workers)		Non workers	
		Number	Percent	Number	Percent	Number	Percent	Number	Percent
Rural	27,467	7,367	26.82	4,163	15.16	11,531	41.98	15,936	58.02
Urban	25,662	6,936	27.03	884	3.44	7,820	30.47	17,842	69.53
<b>Total</b>	<b>53,129</b>	<b>14,303</b>	<b>26.92</b>	<b>5,047</b>	<b>9.30</b>	<b>19,351</b>	<b>36.22</b>	<b>33,778</b>	<b>63.77</b>

Source: Census of India (2011).

As per 2011 census the total share of the working population is 36.22 percent including both main and marginal workers i.e., 26.92 percent and 9.30 percent respectively in

Silapathar Planning Area. The share of the main and marginal workers indicates that the majority of the workers are under the category of main workers. The share of the dependent population is 63.77 percent which is way higher than the independent worker population of 36.22 percent which indicates that the rate of unemployment is very steep in the town. (**See Figure 4.2 and Table 4.2**).

Figure 4.2: Main, Marginal and Non-workers in Silapathar Planning Area (in percent), 2011



Source: Census of India (2011).

#### 4.3. Work Classes

As per census 2011, total number of total workers i.e., main and marginal are 7,820 which accounts to 30.47 percent of the total population. The category of workers is further divided into cultivators, agriculture labourers, household industry workers and other workers.

In rural areas the share of cultivators is the highest that is 75.7 percent, followed by Other Workers that is 12.87 percent, agricultural labourers that is 9.3 percent and household industry workers that is 2.06 percent. Whereas in urban areas the share of other workers is highest having a share of 79.25 percent followed by cultivators of 7.42 percent, agriculture labourer's 1.9 percent and lastly household industry workers of 1.07 percent (**See Table 4.3**).

Table 4.3: Workers on Economic Activity in Silapathar Planning Area, 2011

Area	Total Population	Total workers (main + marginal workers)	Cultivators		Agriculture Labourers		Household industry workers		Other Workers	
			Number	Percent	Number	Percent	Number	Percent	Number	Percent
Urban	25,662	7,820	665	8.5	146	1.87	123	1.57	6,886	88.06
Rural	27,459	11,916	9,024	75.7	1,116	9.3	245	2.06	1,533	12.87
<b>Total</b>	<b>53,129</b>	<b>19,736</b>	<b>9686</b>	<b>42.1</b>	<b>1262</b>	<b>5.6</b>	<b>368</b>	<b>1.8</b>	<b>8,419</b>	<b>50.5</b>

Source: Census of India (2011).

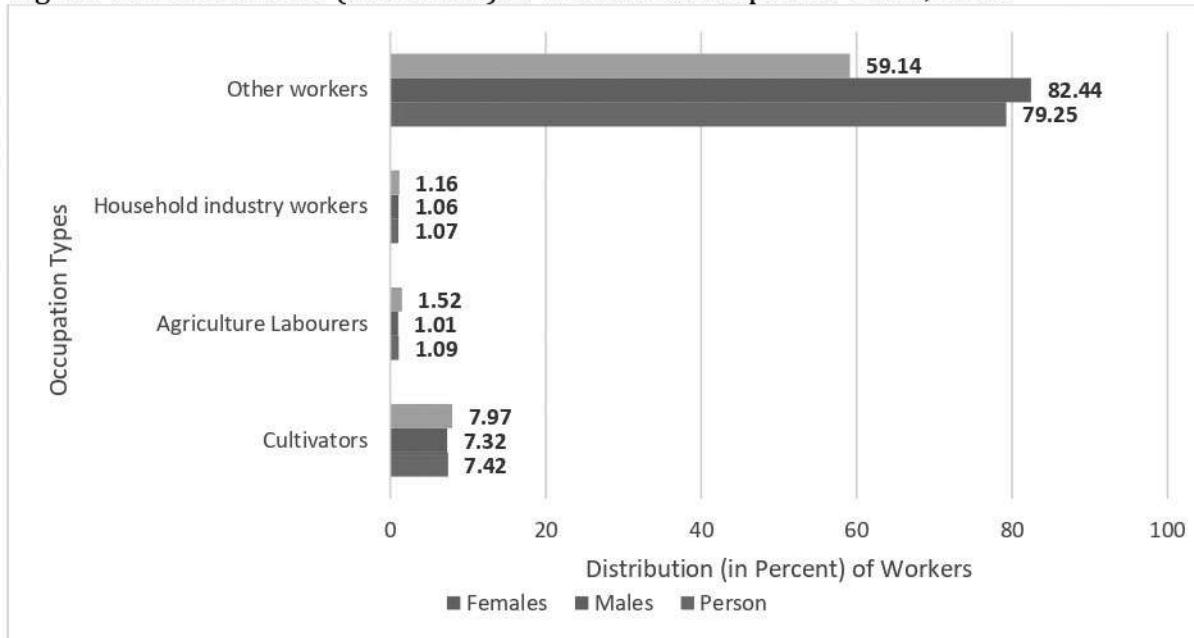
Furthermore, in analysis of urban total workers, overall total workers increased between 2001 and 2011 from 6,880 to 7,820 respectively. However, a drastic decrease in the numbers of workers can be seen in two categories that is agriculture labourers and cultivators. Agricultural workers reduced from 168 in 2001 to 146 in 2011 while cultivator increased from 607 in 2001 to 665 in 2011. Household industry workers also saw an increase in the number of workers from 87 in 2001 to 123 in 2011. The territory sector also witnessed growth between 2001 and 2011 where number of workers in other workers category increased from 6,018 in 2001 to 6,886 in 2011 (See Table 4.4 and Figure 4.3).

Table 4.4: Distribution of Workers in Silapathar Town, 2001, 2011

Person (Male and Females)	Total Population	Total workers (main + marginal workers)	Category of Workers							
			Cultivators		Agriculture Labourers		Household industry workers		Other workers	
			Number	Percent	Number	Percent	Number	Percent	Number	Percent
<b>2001</b>										
Person	22,516	6,880	607	8.8	168	2.4	87	1.3	6,018	87.5
Males	12,025	5,945	404	6.8	82	1.4	45	0.8	5,414	91.1
Females	10,491	935	203	21.7	86	9.2	42	4.5	604	64.6
<b>2011</b>										
Person	25,662	7,820	665	8.50	146	1.87	123	1.57	6,886	88.06
Males	13,350	6,704	539	8.04	101	1.51	94	1.40	5,970	89.05
Females	12,312	1,116	126	11.29	45	4.03	29	2.60	916	82.08

Source: Census of India (2001 and 2011).

Figure 4.3: Distribution (in Percent) of Workers in Silapathar Town, 2011



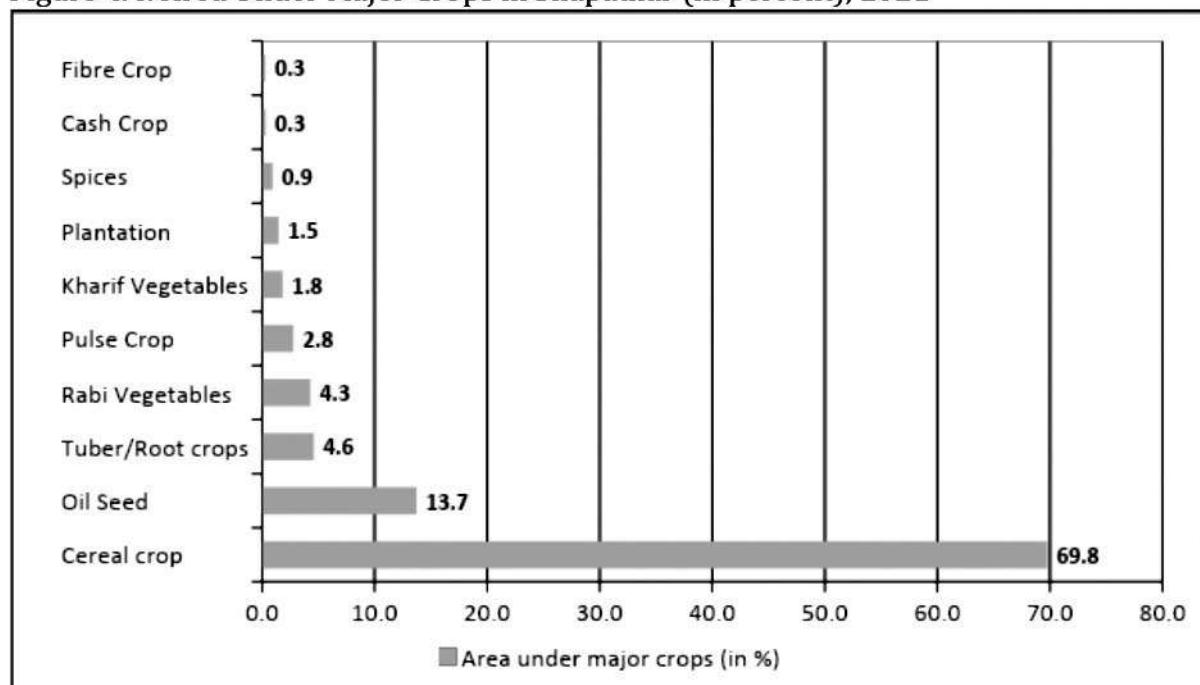
Source: Census of India (2011).

Based on the 2011 work classes, the agriculture and household industry workers have the lowest workforce percentage of 1.09 and 1.07 percent respectively (**See Figure 4.3**). The highest share of workers is in other types of occupations (79.25 percent) which indicates that most of them are not involved in primary class which need to be looked into in the near future and involve more of them into the primary work sector. Furthermore, share of female workforce in cultivators, agriculture labourers and household industry workers is higher than male which indicates more work opportunities for females in the near future.

#### 4.4. Agriculture and Allied Activities

In Silapathar town after the tertiary sector generally people here are engaged in agriculture and allied activities. A sharp decrease in the involvement of workers in this field is observed between 2001 and 2011 as agricultural workers reduced from 168 in 2001 to 85 in 2011. Major crops grown here are cereal crops consisting of summer, autumn, and winter paddy along with maize which occupies 69.8 percent of land under agriculture, followed by oil seed occupying 13.7 percent. Fibre crop, cash crop and spices are the least grown crops acquiring less than 1 percent of the agricultural land respectively (**see Figure 4.5**). Further, cropping intensity of Silapathar is 152.37 percent which is lower than the district cropping intensity of 160.22 percent.

Figure 4.4: Area Under Major Crops in Silapathar (in percent), 2021



Source: District Agriculture Office (2022).

Operational holdings analysis shows that share of landless farmers in Silapathar is less than that of the total districts by 7.83 percent as shown in **Table 4.5**. Only, 10.62 percent of families doesn't possess agricultural land. Around 4.86 percent of households own a land parcel greater than 2 hectares, followed by 28.94 percent with a land holding size of around 1 to 2 hectare, 55.59 percent with a land holding size of less than 1 hectare.

Table 4.5: Agricultural Land Holding in Silapathar, 2022

<b>OPERATIONAL HOLDINGS</b>	<b>Silapathar ADO circle</b>		<b>District Total</b>	
	<b>Number</b>	<b>Percent</b>	<b>Number</b>	<b>Percent</b>
Big farmers (>2 ha)	1,470	4.86	11,765	7.41
Small farmers (1-2 ha)	8,750	28.94	45,300	28.53
Marginal farmers (<1 ha)	16,809	55.59	72,409	45.61
Landless farmers (<0.4 ha)	3,210	10.62	29,292	18.45
	30,239		1,58,766	

Source: District Agriculture Office (2022).

#### 4.5. Industries

Most of the workers are involved in other workers category which encompasses industry sector as well. However, Silapathar lacks industrial development. Main reasons for lack of

manufacturing industries include inadequate raw material, unavailability of skilled labor, lack of market potential and connectivity. At present there are many micro and small industries involved in textile manufacturing and food processing apart from others. The main existing industrial area of Silapathar is of 2.5 hectare consisting of a flour mill and lies within the municipal boundary along the Silapathar-Likabali Road (**See Figure 4.5**).

There is a need for the modernization in this sector. Weavers need to be trained for newer techniques which enhances production and takes less time without compromising on its indigenousness. With the availability of raw material and skilled weavers, there is potential for growth of medium scale silk industries in Silapathar. This approach can also be integrated in food processing industries as well.

Figure 4.5: Flour Mill in Silapathar Municipal Area



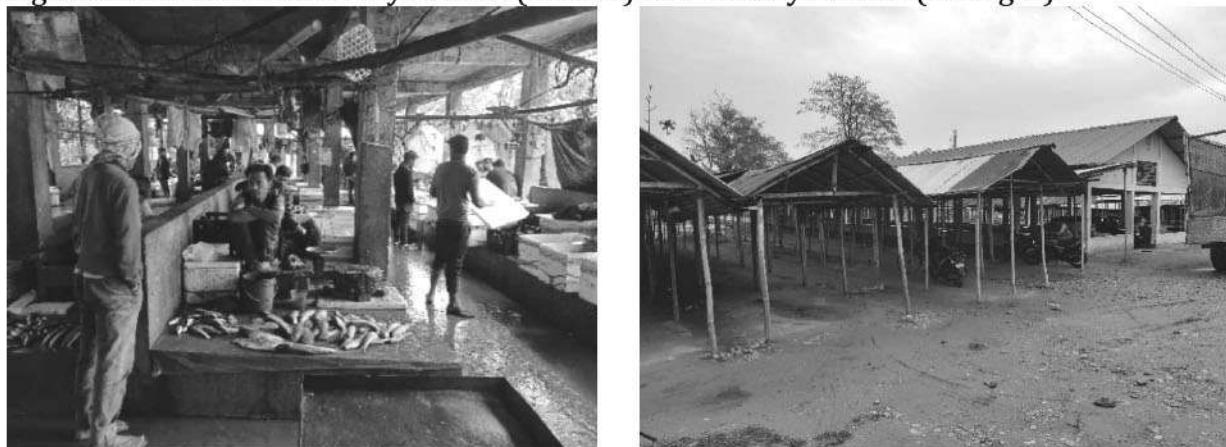
Source: Primary Survey (2022).

#### 4.6. Trade and Commerce

In Silapathar, main trading commodities include raw silk and other fabrics as well as processed grains. Other trades and commerce activities include groceries, utensils, garments, footwear, stationary, medical, etc. Infrastructure provision to facilitate trade and commerce in Silapathar remain highly inadequate. Majority of the commercial spaces are developed along the Silapathar-Likabali Road within the municipal boundary as it is the main sub-arterial road bifurcating the town. This has caused various problems with respect to transport and loading and unloading of goods.

Apart from this there is one Weekly Bazar area located adjacent to Silapathar Municipal Board Office and one Daily Bazar on the north of railway line cutting Silapathar-Likabali Road. However, the conditions of both these markets are very poor without any designated spaces and other civic amenities (**See Figure 4.6**). Insufficient provision of shopping centers has led to the proliferation of shops along NT Road affecting main traffic in the town.

Figure 4.6: Condition of Daily Market (on Left) and Weekly Market (on Right)



Source: Primary Survey (2022).

#### 4.7. Conclusions

Silapathar town is an upcoming commercial town which serves as providers of many commodities to neighbouring towns like Dhemaji, Janoi and the district of Arunachal Pradesh. The town is a commercial town however lacks proper distribution of work forces, for which only 36.22 percent of the total population are involved in work. Furthermore, work opportunities in the town based on male female ratio is very low, for which equally weighted should be given to the female workers by introducing capacity building and workshops to enhance their work skills. Silapathar town is rich in production rice, wheat and silk for which proper cultivation and selling of them using the town as the backbone of a commercial unit can help build the industry and commerce sector of the town.

## CHAPTER 5: TRAFFIC AND TRANSPORTATION

### 5.1. Introduction

Transport is the backbone of a country's economy because it allows for greater exploitation of resources in backward areas by connecting them to more advanced places. The transportation system contributes in the industrialization and urbanization processes. It promotes homogeneity and national integration in ideas and culture by allowing individuals to roam freely and interact with one another.

Silapathar is well connected via roadways, railways, and airways to the rest of the state and the nation. National highway 515 passes through Silapathar planning boundary connects NH-15. The closest airport to Silapathar is Mohanbari Airport, which is located within the boundaries of the city of Dibrugarh. NH-52 or NH-15 is currently connected to the city. Assam State Transport Corporation (ASTC) runs bus lines to nearby cities and towns. A large number of passengers are transported daily by night services to West Bengal, Nagaland, Arunachal Pradesh, and Guwahati as well as private share taxis that run between major cities. People from the city and the surrounding areas have access to the state capital Guwahati through the Silapathar Railway Station, part of the Rangiya Railway Division. One can easily access the Dibrugarh Rajdhani Express from New Sissiborgaon and Silapathar Railway Station via direct train connections to the Dibrugarh Railway Station.

Moreover, in order to assess the traffic and transportation system in Silapathar planning area scientific traffic surveys and studies were necessary to establish the baseline status and identify problems and concerns in order to analyze the traffic and transportation system features of a region. Data collection included classified traffic volume counts, as well as a parking survey to examine passenger and cargo movement patterns. Furthermore, data was gathered from secondary sources such as Google Maps in order to access the road network inventory as well as transit speed and delay.

### 5.2. Surveys to Assess Traffic and Transportation Characteristics

From 28 to March 30, 2022, the School of Planning and Architecture, New Delhi (2022) performed primary surveys. These assessments focused specifically to the movement of passengers and goods throughout Silapathar. The survey's findings are shown below:

### 5.2.1. Classified traffic volume count survey

The number of vehicles that pass through a road over a specific time period is counted as classified traffic volume. To understand the traffic characteristics in terms of average daily traffic, traffic composition, peak hour traffic, and directional split at each survey location, classified traffic volume count surveys were carried out. These vehicles are further categorized based on their PCU values. It is defined as the procedure to determine mainly volume of traffic moving on the roads at a particular section during a particular time. It is usually expressed in terms of Passenger Car Unit (PCU). PCU is a metric used to assess traffic-flow rates on a highway. A Passenger Car Unit is a measure of the impact that a mode of transport has on traffic variables (such as headway, speed, density) compared to a single standard passenger car. This is also known as passenger car equivalent (E-surveying, 2022). Traffic Volume Count Surveys were conducted at 2 locations in both directions for 9 hours duration. **Figure 5.4** shows the location of classified traffic volume count survey. Further details are numerated in the table below:

Table 5.1: Details of Surveys Carried out in Silapathar.

Sl. No.	Road Name	Direction	Survey Duration in Hours	Time
1.	Silapathar Main Road	Towards Likabali	9	8:30 am- 5:30 pm
2.		Towards Kulajan		
3.	Lachit Borphukan Road	Towards Silapathar town	9	8:30 am- 5:30 pm
4.		Towards Model Hospital		

Source: SPA New Delhi (2022)

Classified Traffic Volume Count Survey was conducted in two locations, one at Silapathar Main Road, and another is Model Hospital Road. The first road passes through Silapathar connecting Dibrugarh and Arunachal Pradesh. The second survey road connects Silapathar main road to Dhemaji via NH-15. (**See Figure 5.1**).

**Table 5.1** shows the details of surveys carried out in Silapathar. To calculate the PCU value, and to determine peak hour, specific PCU values are multiplied with number of that specific

vehicle which passes through the survey check post. The counting of vehicles is done for both incoming and outgoing.

Table 5.2: Passenger Car Unit (PCU) Values as per IRC 106-1990

<b>Types of Vehicles</b>	<b>Passenger Car Unit (PCU)</b>
Two-wheeler	0.75
Car	1.00
Auto/ taxi	2.00
LCV	1.40
Tempo	1.00
Truck	2.20
Six axle trucks	5.00
Bus	2.20
Others	4.00
Cycle	0.50
Carts	2.00

Source: Indian Road Congress, 1990

### 5.2.2. Parking survey

The primary goal of the parking surveys was to assess the parking preferences, need and demand of parking areas along the stretch of Silapathar Main Road. So, parking survey was carried out along the stretch of Silapathar Main Road on March 30, 2022, by SPA New Delhi team.

## 5.3. Traffic and Travel Characteristics

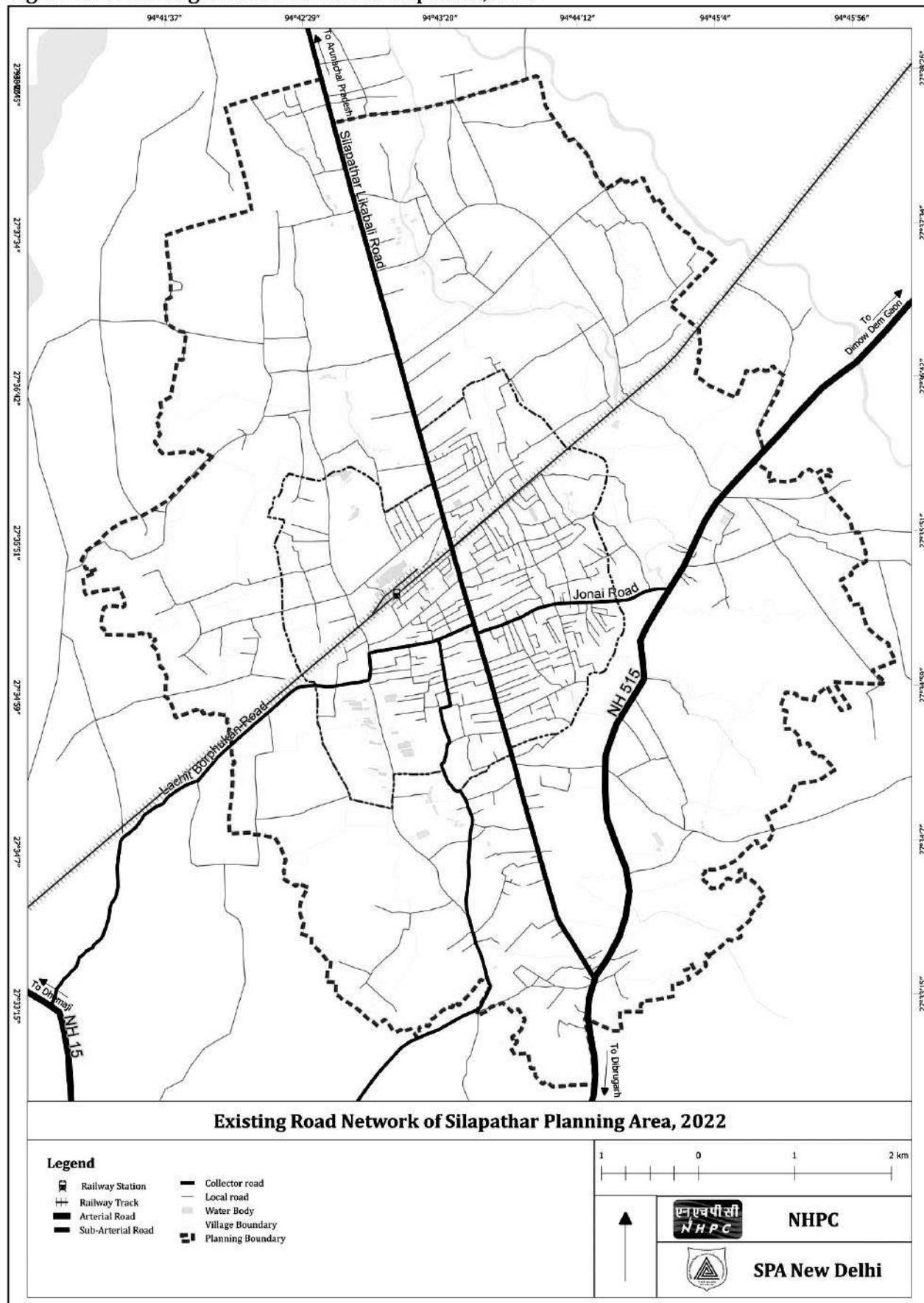
### 5.3.1. Road network characteristics

To evaluate the current capacity of the roads, the level of service provided, recognize any constraints, and assess the potential for improvement and up-grading of the road network

to accommodate the current and projected demand of traffic, it is crucial to have a thorough understanding of the characteristics of the road network.

**Table 5.1** shows the primary road network of the study area of Silapathar with a total length of 25.3 kms. Table 5.3**Error! Reference source not found.** shows the salient road network characteristics of the primary road network length. The ROW varies between 45 m to 6 m.

Figure 5.1: Existing Road Network of Silapathar, 2022



Source: SPA New Delhi (2022)

Table 5.3: Road Network Characteristics of Major Roads in Silapathar, 2022

Road Hierarchy	Road name	Length (kms)	ROW (In meter)	Carriage width (In meter)	Material	Median and Footpath	Drainage
Arterial Road	National Highway (NH 515)	6.2	45	9	Bituman (Black Top)	No Median and footpath along either side	No
Sub-Arterial Road	Silapathar Main Road	9.6	30	9			Yes
Collector road	Lachit Borphukan Road	3.1	15	6.5			No
	Jonai Road	2.1	15	6.5			No
Total=		21.0	-	-			

Source: SPA New Delhi (2022).

Figure 5.2: National Highway 515, 2022



Source: SPA New Delhi (2022)

Figure 5.3: Lachit Borphukan Road, 2022



Source: SPA New Delhi (2022)

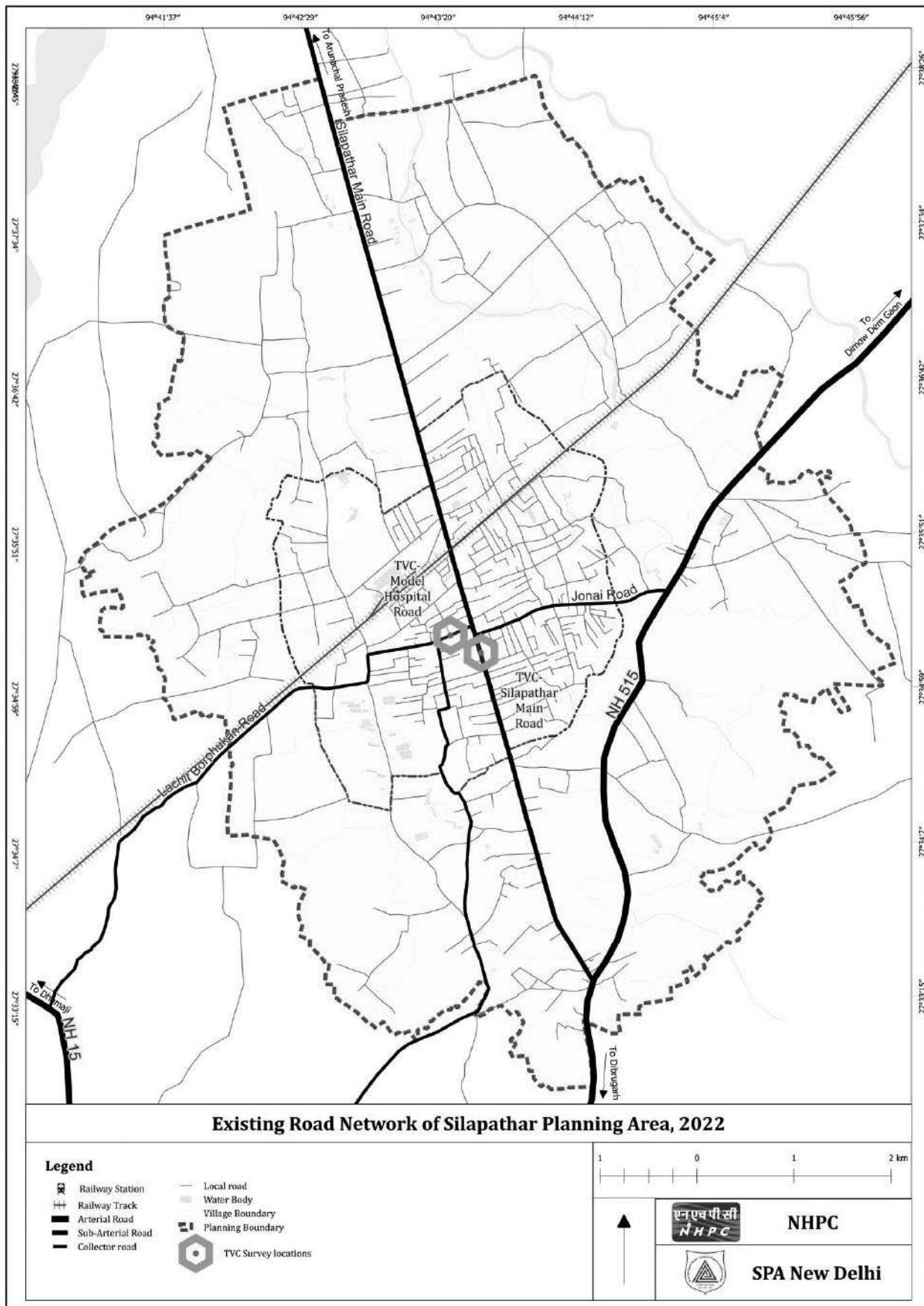
### 5.3.2. Traffic Volume Count for Silapathar

Traffic Volume Count was conducted in two locations at Main Road Silapathar and Lachit Borphukan Road. The first road connects Kulajan to Likabali. The second survey road connects Silapathar Town to Dhemaji via NH15. The duration of the survey was between 8:30 A.M. to 05:30 P.M. and we counted almost 20 thousand vehicles. To calculate the PCU value, and to determine peak hour, specific PCU values (**Table 5.2**) are multiplied with number of that specific vehicle which passes through the survey check post. The counting of vehicles is done for both incoming and outgoing.

### 5.3.3. Hourly variation in traffic

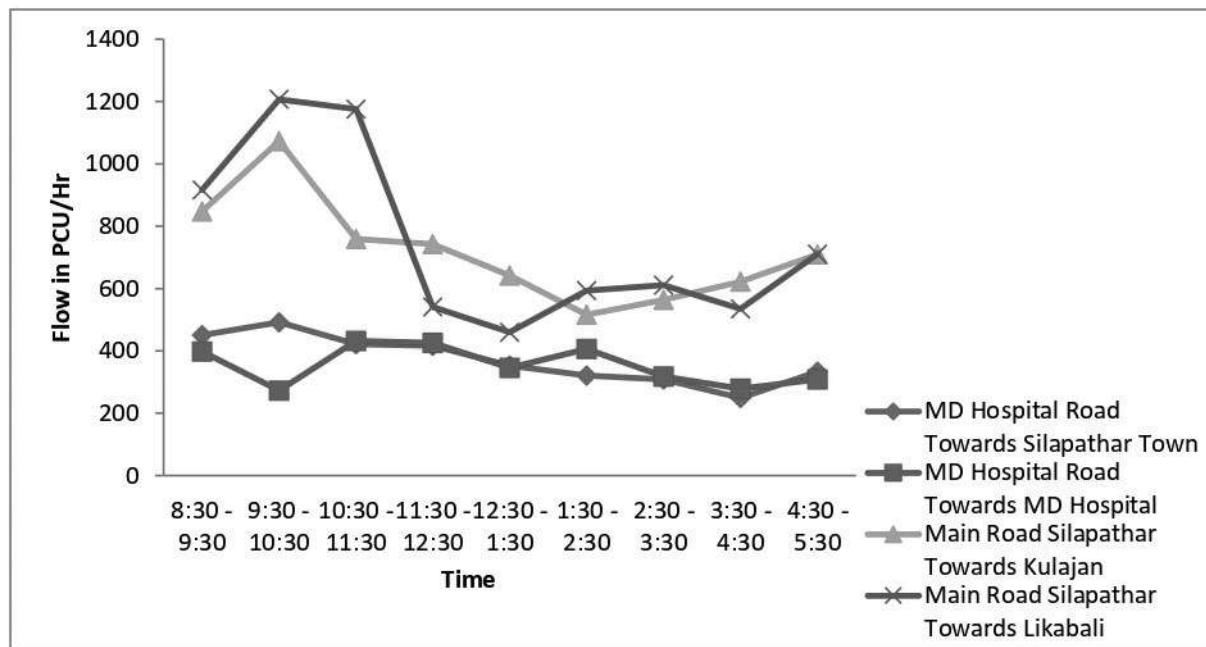
Findings of TVC survey reveal heavier traffic on the Main Road Silapathar (towards Likabali) with PCU value of 1207 PCU/hour at the hours between 09:30 A.M.-10:30 A.M. while peak hour for Main Road Silapathar (towards Kulajan) was also between 09:30 A.M.-10:30 A.M. with a PCU value of 1073 PCU/hour. The lowest traffic was found on Lachit Borphukan Road (towards Model Hospital) which was highest with 432 PCU/hour in the morning hours of 10:30 A.M.-11:30 A.M. and decreased as time progressed. At the same road, the PCU value for traffic on Lachit Borphukan Road towards Silapathar Town was 392 PCU/hour between 09:30-10:30 A.M. hour (**refer Figure 5.5**).

Figure 5.4: Classified Traffic Volume Count Survey Locations, 2022



Source: SPA New Delhi (2022)

Figure 5.5: Traffic Volume Count for Silapathar Town, 2022

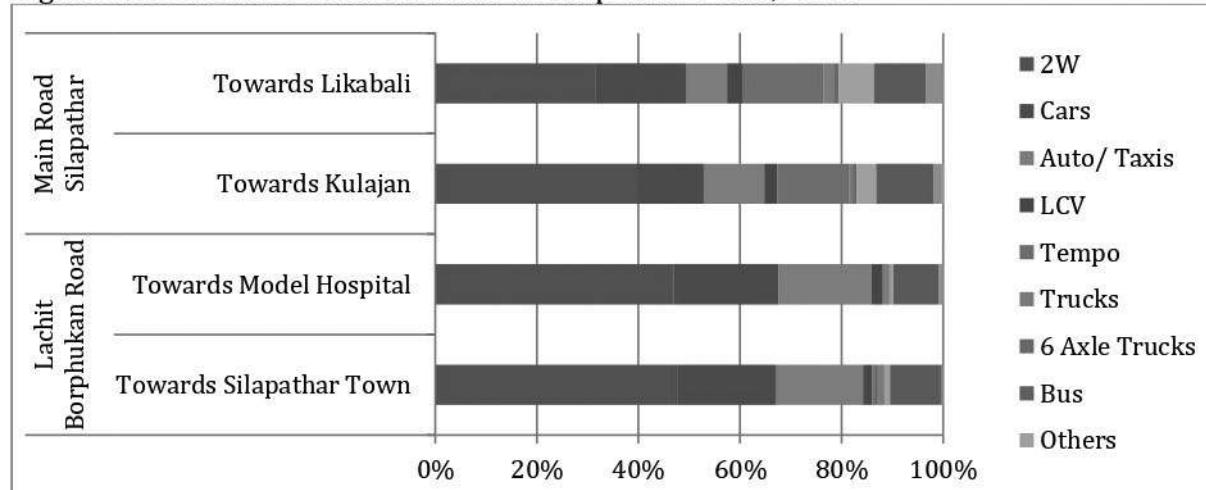


Source: Primary Survey (2022)

#### 5.3.4. Traffic Composition

Most recurring vehicle type was two wheelers for both route however, cars and auto/taxi traffic was found on Lachit Borphukan Road, in both directions (towards Silapathar town and towards Model Hospital). Tempo movement was more on Main Silapathar Road. Cycle movement was evenly distributed so does the Light Commercial Vehicles (LCV). Cart movement was more on Main Silapathar Road. Heavy moving vehicles (6 axle trucks) were found on Main Silapathar Road which increased the PCU value for this route (**see Figure 5.6**).

Figure 5.6: Classified Traffic Volume in Silapathar Town, 2022



Source: SPA New Delhi (2022).

### 5.3.5. Average daily traffic

A total traffic volume of 19,758 PCUs enter and leave study area daily within duration of 9 hours. Most of the traffic volume can be observed along the Main Road Silapathar say nearly 67 percent and the highest traffic volume can be observed along the Main road Silapathar towards Likabali. Whereas lowest traffic is observed along Lachi Borphukan road towards Model Hospital. Further, the average daily entering and exiting traffic recorded at the survey locations is shown in **Table 5.4.**

Table 5.4: Average Daily Traffic Volume within Silapathar, 2022

<b>Survey Locations</b>	<b>Number</b>	<b>Percent</b>	<b>Directions</b>	<b>Number</b>	<b>Percent</b>
Lachi Borphukan road	6,532	33	Towards Silapathar Town	3,345	17
			Towards Model Hospital	3,187	16
Main Road Silapathar	13,226	67	Towards Kulajan	6,476	33
			Towards Likabali	6,750	34
<b>Total</b>	<b>19,758</b>	<b>100</b>		<b>19,758</b>	<b>100</b>

Source: SPA New Delhi (2022)

### 5.3.6. Speed and delay characteristics

Any study involving transportation must include speed and delay surveys. The survey provides information on a variety of topics, including travel speed, average delays, trip times, the reasons for delays, average link lengths, etc. Using Google Map, a speed and delay analysis were conducted. **Table 5.5** shows the speed and delay profile of passenger and goods traffic within Silapathar. The speed range between 65 km per hour (kmph) to 21 kmph during the peak hour. Since, most of the traffic is along Main Road Silapathar, so around 4-minute delay can be observed during the peak hour. Along the Lachit Borphukan Road and Junai road around 4 minute and 2-minute respective delays can be observed specially during the peak hour due to deteriorated road conditions and commercialization along the street.

Table 5.5: Speed and Delay Profile in Silapathar, 2022

<b>Road name</b>	<b>Length (kms)</b>	<b>Journey Speed (in kmph)</b>		<b>Delay (In minutes)</b>	<b>Reason for delay</b>
		<b>Typical</b>	<b>Peak hour</b>		
<b>National Highway (NH 515)</b>	6.2	65	65	0	-
<b>Silapathar Main Road</b>	9.6	60	21	4	Due to unauthorised parking and railway crossing
<b>Lachit Borphukan Road</b>	3.1	45	35	3	Poor road quality and commercialization
<b>Jonai Road</b>	2.1	45	40	2	Poor road quality and commercialization
<b>Total</b>	21	-	-	-	

Source: Google maps (2022)

### 5.3.7. Parking Demand Assessment along Main Road Silapathar

Travel times have increased, and trips have been delayed as a result of the traffic congestion. Traffic congestion has an impact on the environment, such as air pollution and global warming, as well as on travel costs, travel time, mobility, accessibility, and productivity. To assess the parking demand along the major road SPA New Delhi team conducted a parking demand assessment survey for duration of 4 hours along Main Road Silapathar. It was observed that since most of the vehicles are parked along the road which hinders the pedestrian movement and pedestrians are forced to risk their life and walk along the shoulders or on the road at the Main Road Silapathar. So, there is a huge demand for parking along Main Road Silapathar especially for two wheelers and cars. Further along the stretch of Main Road Silapathar nearly 127 vehicles were parked per hour over a stretch of around 250 meters (**see Table 5.6**).

Table 5.6: Parking Survey Outcome along Silapathar Road

	<b>Towards Likabali (Vehicles/hour)</b>	<b>Towards Kulajan (Vehicles/hour)</b>
2 Wheeler	50	61
Car	32	35
Auto/Taxi	24	24
Tempo	12	7
Others	9	5
<b>Total</b>	<b>127</b>	<b>131</b>

Source: SPA New Delhi (2022)

Table 5.7: Parking Along Main Road Silapathar, 2022



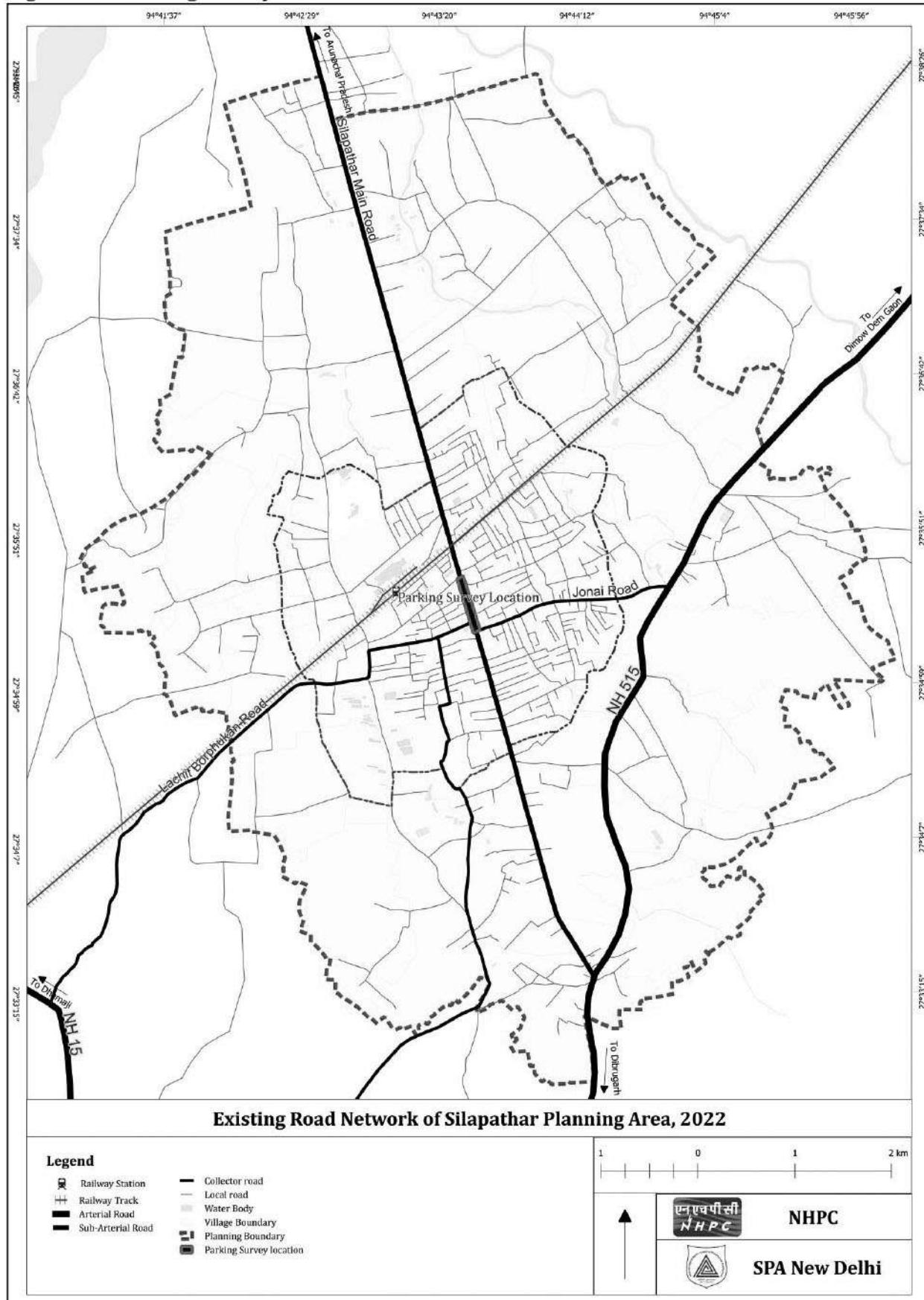
Source: SPA New Delhi (2022)

Table 5.8: Parking Along Both Direction at Main Road Silapathar, 2022



Source: SPA New Delhi (2022)

Figure 5.7: Parking Survey Location, 2022



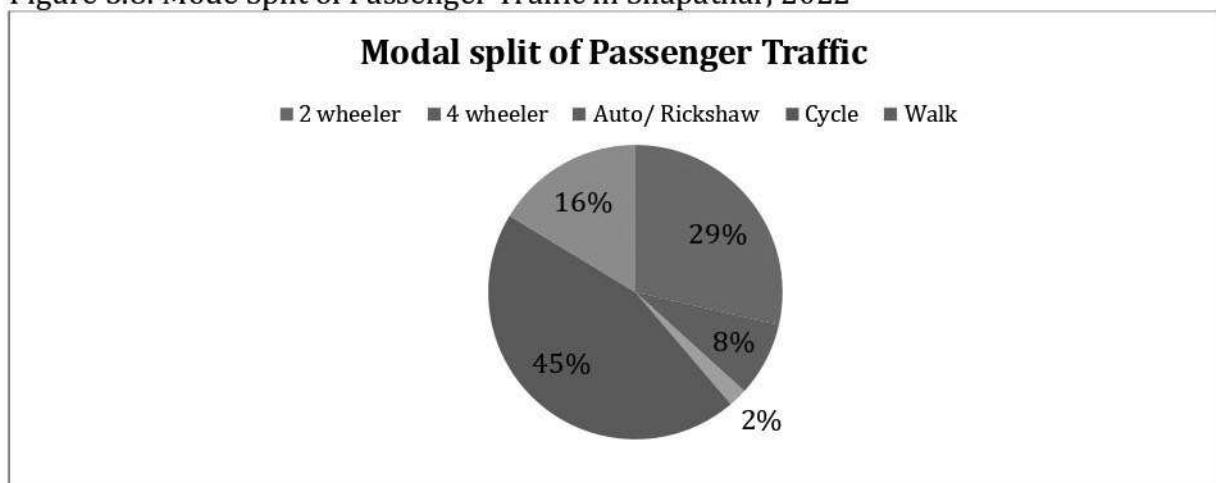
Source: SPA New Delhi (2022)

## 5.4. Desire Pattern of Passenger Traffic

### 5.4.1. Mode of travel

Primary survey revealed that due to the smaller size of the town, most of the passenger trips within Silapathar are based on walking and cycling (say 61 percent of the trips) and lesser dependency on public transportation system. In contrast, 37 percent of trips are carried out in personal vehicles, either two or four wheels. **Figure 5.6** shows the modal share of passenger trips within Silapathar.

Figure 5.8: Mode Split of Passenger Traffic in Silapathar, 2022

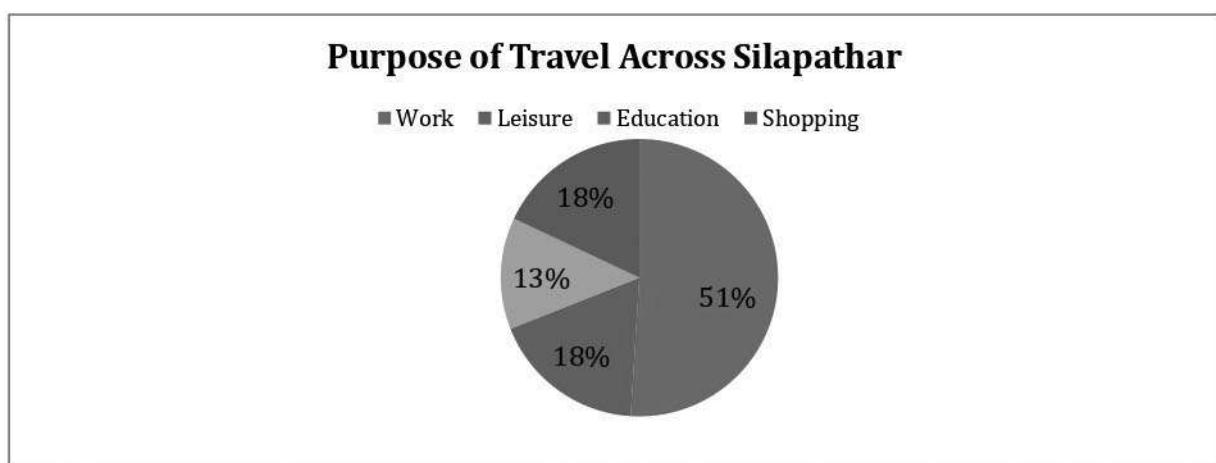


Source: SPA New Delhi (2022)

### 5.4.2. Purpose of travel

Around 51 percent of the trips captured at survey locations are work and business-related trips, followed by 18 percent shopping, and 18 percent leisure trips. Further, 13 percent are educational trips (**Figure 5.9**).

Figure 5.9: Purpose of Passenger Travel in Silapathar, 2022



Source: SPA New Delhi (2022)

### 5.5. Conclusions

With the rest of the state and nation, Silapathar is well connected by road, rail, and air. The planning boundary of Silapathar is traversed by National Highway 515, which connects to NH-15. Mohanbari Airport, which is situated inside the boundaries of the city of Dibrugarh, is the closest airport to Silapathar. The town is divided into two identical halves by the main road Silapathar, which runs vertically through it and links Silapathar to Dibrugarh and Arunachal Pradesh.

Major findings reflect that the current road layout discourages pedestrian movement and also lacks proper drainage network. At few locations there can be observed encroachment within the ROW of existing road network.

## CHAPTER 6: PHYSICAL INFRASTRUCTURE

### 6.1. Introduction

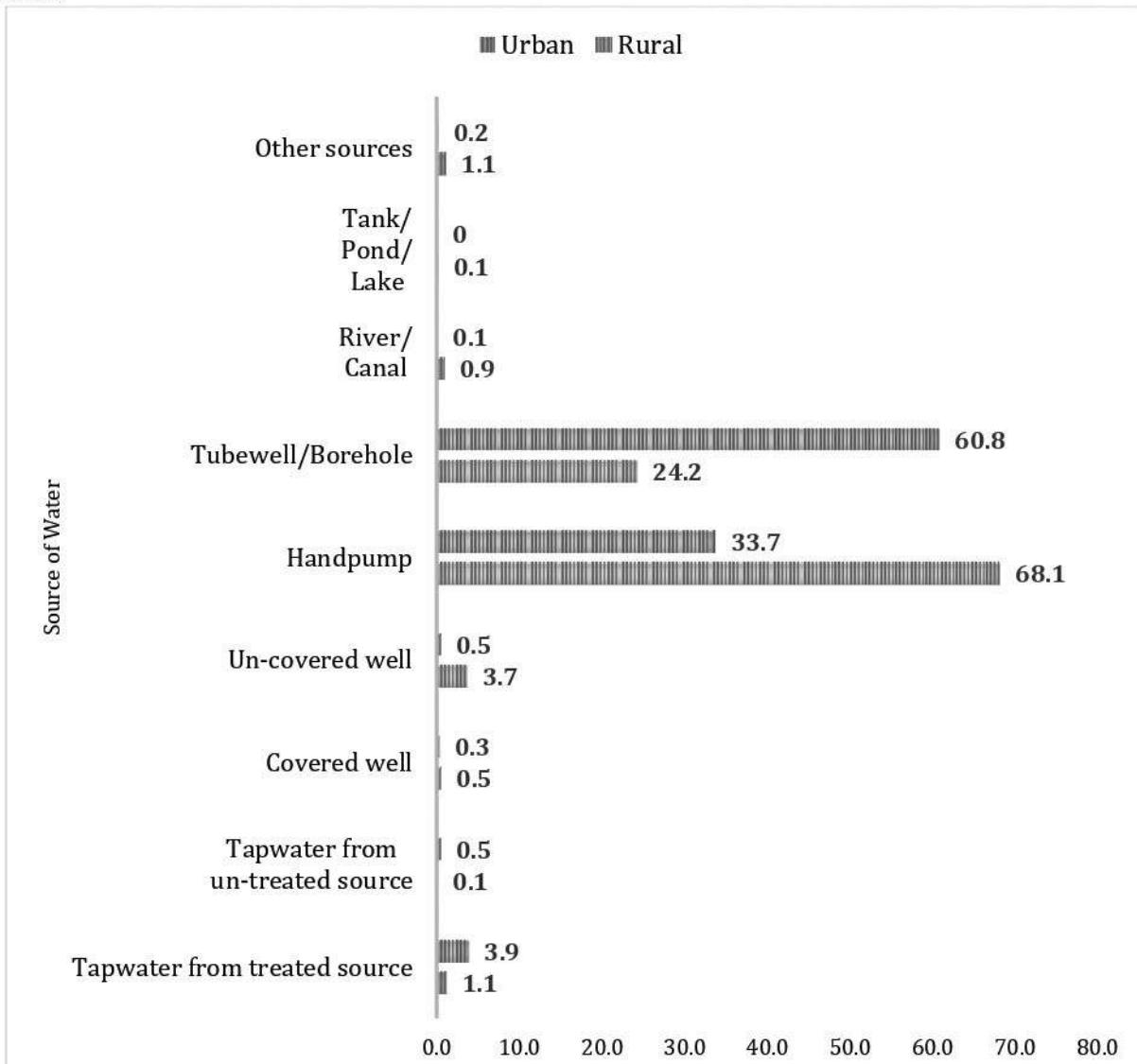
Physical infrastructure is made up of five major components: water supply, sewerage, drainage, and solid waste management. The Water Supply System is responsible for delivering safe drinking water to every household connected to the system. The Sewerage System is concerned with the efficient disposal of human waste without endangering the region's ecological system. This also ensures that human health is not harmed by diseases such as Hepatitis, Cholera, Diarrhoea, Typhoid, and other parasitic infections, which are all too common and can easily spread due to insufficient effluent treatment. The drainage system is responsible for effectively channelling wastewater from households as well as runoff from roads and open areas.

Well-organized drain lines can even help to prevent flooding and water logging, as well as serve as a source of raw water for the Water Treatment Plant and irrigation. Solid waste management is concerned with the various types of waste produced by humans. These wastes are transported, separated, and processed through land filling or incineration, which are not the best methods because excessive land filling degrades soil fertility and can pollute ground water through seepage.

### 6.2. Water Supply

According to Census of India 2011, highest dependency is on Hand-pump in Silapathar rural areas that is 68.1 percent while in urban areas the highest dependency is on tube well/ bore well that is 60.8 percent. Overall figures indicate that in Silapathar urban areas main sources are tube well/ bore well and Handpump which accounts for 94.5 percent together. This condition may lead to depletion of ground water table and result in scarcity of water in the future as the dependency on ground water is very high. The similar condition is reflected in the rural areas of Silapathar where 92.3 percent of household is dependent upon tube well/ bore well and handpump (**see Figure 6.1**). This indicates that their needs an extensive development for potable water supply for both Silapathar urban and rural areas.

Figure 6.1: Sources of Water for Domestic Use in Silapathar Planning Area (in percent), 2011



Source: Census of India (2011).

#### 6.2.1. Ward wise sources of Drinking Water in Silapathar Town

Water supply in the town includes water availability, water sources, water treatment, water supply to consumers, household water connected to taps, and coverage of the town's water supply system. The main water sources in Silapathar town are tube wells or boreholes, hand pumps, and tap water. Around 60.8 percent of water supply is sourced from tube wells and bore wells, with hand pumps accounting for 33.7 percent and tap water accounting for only 3.9 percent. People rely primarily on ground water sources due to a lack of tap water connections (**See Table 6.1**).

According to Census of India 2011, the highest dependency on tube well or borehole is in ward 5 with 75.5 percent of household depending for their potable water followed by ward 2 with 65.7 percent. Ward 3 has the least dependency on tube well or borehole with 51.5 percent.

Table 6.1: Main Sources of Drinking Water in Silapathar Town (in percent), 2011

Area	Tap water from treated source	Tap water from un-treated source	Covered well	Un-covered well	Hand pump	Tube well/ Bore well	River/Canal	Other sources
<b>Ward 1</b>	8.8	0.5	1.2	1.5	35.5	52.3	0.0	0.1
<b>Ward 2</b>	1.7	0.0	0.0	0.1	32.1	65.7	0.0	0.3
<b>Ward 3</b>	4.3	1.0	0.1	0.3	42.5	51.5	0.1	0.3
<b>Ward 4</b>	1.4	0.4	0.2	0.4	21.9	75.5	0.1	0.3
<b>Total</b>	<b>3.9</b>	<b>0.5</b>	<b>0.3</b>	<b>0.5</b>	<b>33.7</b>	<b>60.8</b>	<b>0.1</b>	<b>0.2</b>

Source: Census of India (2011).

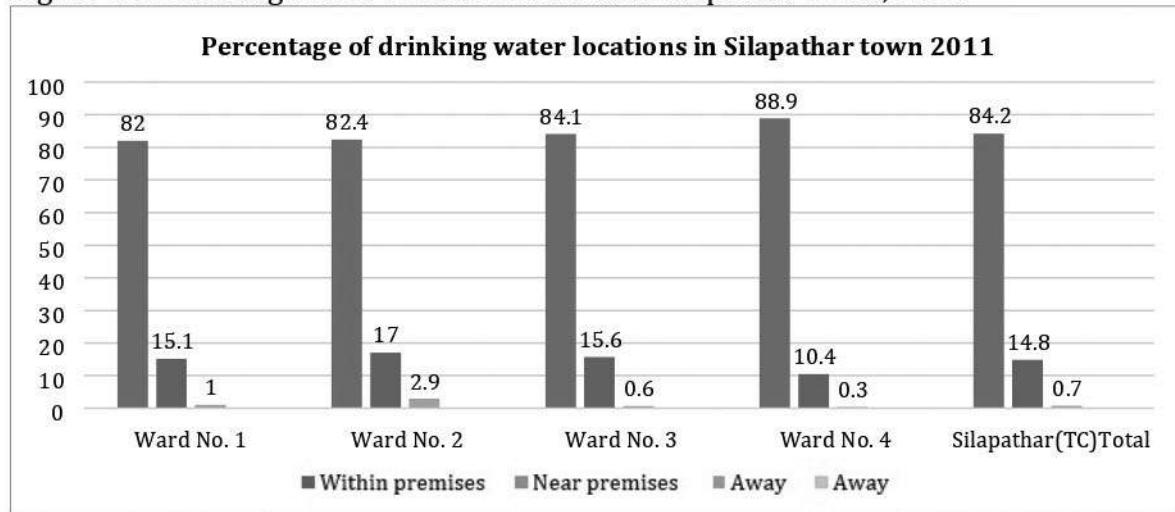
Table 6.2: Location of Drinking Water Sources in Silapathar Town, 2011

Area	Locations of Drinking Water Sources (in percent)				Total
	Within Premises	Near Premises	Away from Premises		
<b>Ward 1</b>	82.0	15.1		1.0	100
<b>Ward 2</b>	82.4	17.0		2.9	100
<b>Ward 3</b>	84.1	15.6		0.6	100
<b>Ward 4</b>	88.9	10.4		0.3	100
<b>Total</b>	<b>84.2</b>	<b>14.8</b>		<b>0.7</b>	<b>100</b>

Source: Census of India (2011).

From the analysis it is observed that 84.2 percent (**See Table 6.2**) of the households have drinking water sources with their premises i.e., hand pumps or ring wells owned individually by a household or shared among by the community of certain household, and 14.8 percent sources are nearer to the housing premises. Overall water sources in the town are easily accessible to the people.

Figure 6.2: Drinking Water Sources Location in Silapathar Town, 2011



Source: Census of India (2011).

#### 6.2.2. Demand Gap for Potable Water in Silapathar Town

Silapathar town has a population of 13,502 people, and the total population within the planning area is 41,434. According to the Central Public Health Environmental Engineering Organization (CPHEEO) manual on Water Supply and Treatment 1999, the recommended maximum water supply for a town with piped water supply but no sewerage network is 70 litres per capita per day (lpcd), so the total water demand is 2.9 million litres per day (MLD). Because there is no potable water supply in Silapathar, the total water demand is calculated to be 2.9 MLD. Considering 20 percent losses such as transmission loss, theft, and leakages, the actual water demand is calculated to be 3.84 MLD, and the actual gap is 3.84 MLD. The fire demand for a town can be calculated using the formulae  $100\sqrt{P}$ , where P is population, according to the CPHEEO 1999 guidelines. As a result, the fire demand is calculated to be 0.02 MLD (see Table 6.3). Thus, the total water demand gap for Silapathar is calculated to be 3.86 MLD.

Table 6.3: Demand Gap for Water Supply in Silapathar Town, 2011

Total Population of Silapathar Planning Area	41,434
Per Capita Water Demand (in LPCD)	70
Total Water Demand (in MLD)	2.9
Transmission and other losses in Percent	20
Total Losses (in MLD)	0.58

Fire Demand (in MLD)	0.02
Actual Water Demand (in MLD)	3.86
Existing Supply (in MLD)	-
Demand Gap (in MLD)	<b>3.86</b>

Source: SPA Delhi (2022).

### 6.3. Drainage Network

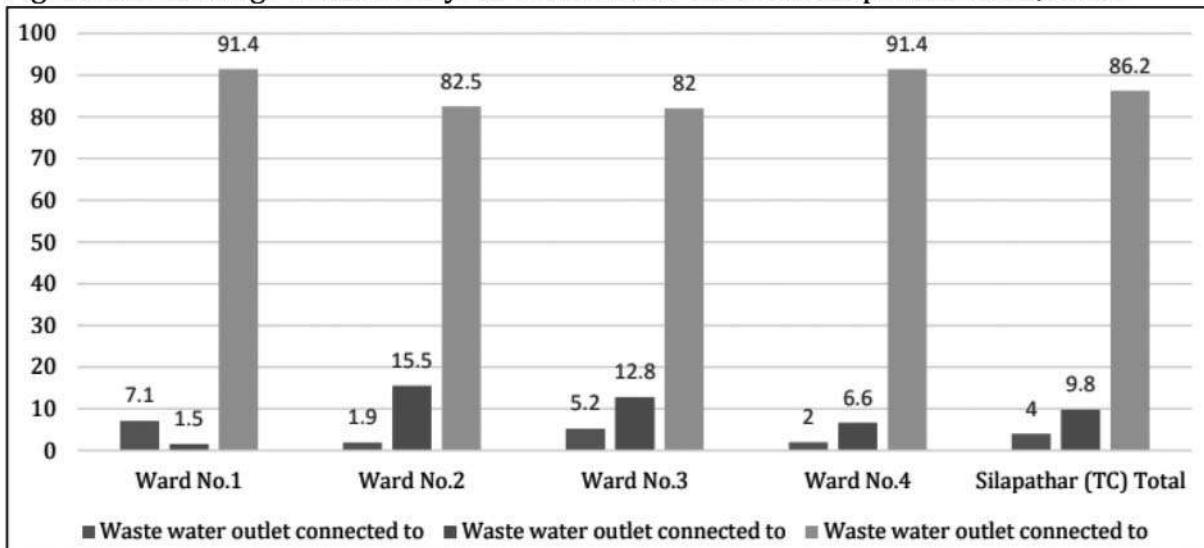
According to CEEW report on Mapping India's Climate Vulnerability 2021, Dhemaji district is one of the most vulnerable districts of Assam to face severe flood issues and thus extensive development at drainage front is necessary to avoid water logging issues within the district. As per Census 2011, In Silapathar town 86.2 percent of the households are not connected with drainage facilities. Ward 1 and 4 has the highest percentage of non-connection to drainage. Most of the drains are open (9.8 percent) and only 4 percent have closed drainage in the whole town (**See Table 6.4 and Figure 6.3**).

Table 6.4: Drainage Connectivity for Wastewater Outlet in Silapathar Town, 2011

Area	Wastewater outlet connected to		
	Closed Drainage in Percent	Open Drainage in Percent	Drainage in Percent
<b>Ward 1</b>	7.1	1.50	91.4
<b>Ward 2</b>	1.9	15.5	82.5
<b>Ward 3</b>	5.2	12.8	82.0
<b>Ward 4</b>	2.0	6.60	91.4
<b>Total</b>	4.0	9.80	86.2

Source: Census of India (2011).

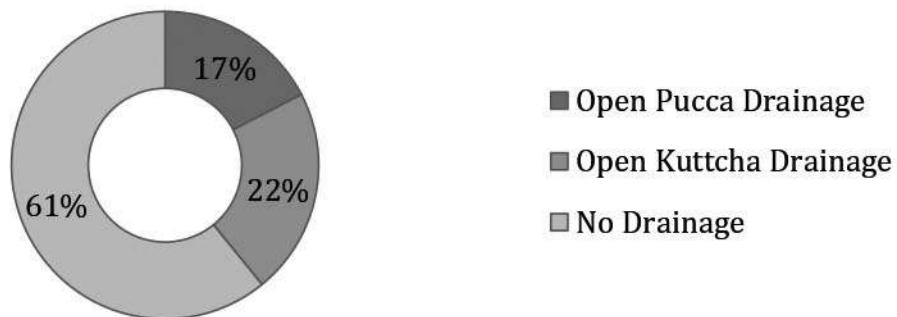
Figure 6.3: Drainage Connectivity for Wastewater Outlet in Silapathar Town, 2011



Source: Census of India (2011).

In Silapathar villages condition of drainage is much poor. Only 9 villages have open drainage system others do not have any drainage system. Out of these 9 villages, 4 villages (17 percent) have open pucca drainage system and the other 5 villages (22 percent) have open kutcha drainage system (see **Figure 6.4**).

Figure 6.4: Status of Drainage in Silapathar Villages



Source: Census of India (2011).

According to India Meteorological Department 2019, average annual rainfall in Dhemaji district is 2,316 mm with rain-day of about 200 days. As per land use of Silapathar planning area, the total built-up in Silapathar planning area is 14.87 sq km and the total area within Planning Boundary is 53.37 sq km. The maximum rainfall recorded at Silapathar is 1,171 mm for 30 days in the year of 2015, which is 39.03 mm or 1.54 inches per day. To calculate peak storm water discharge, formulae of discharge is used which is a product of coefficient of runoff (C), catchment area and rainfall intensity. C is taken as 0.45 for open fields and 0.75 for built-up or constructed area. Hence peak storm water discharge is calculated as

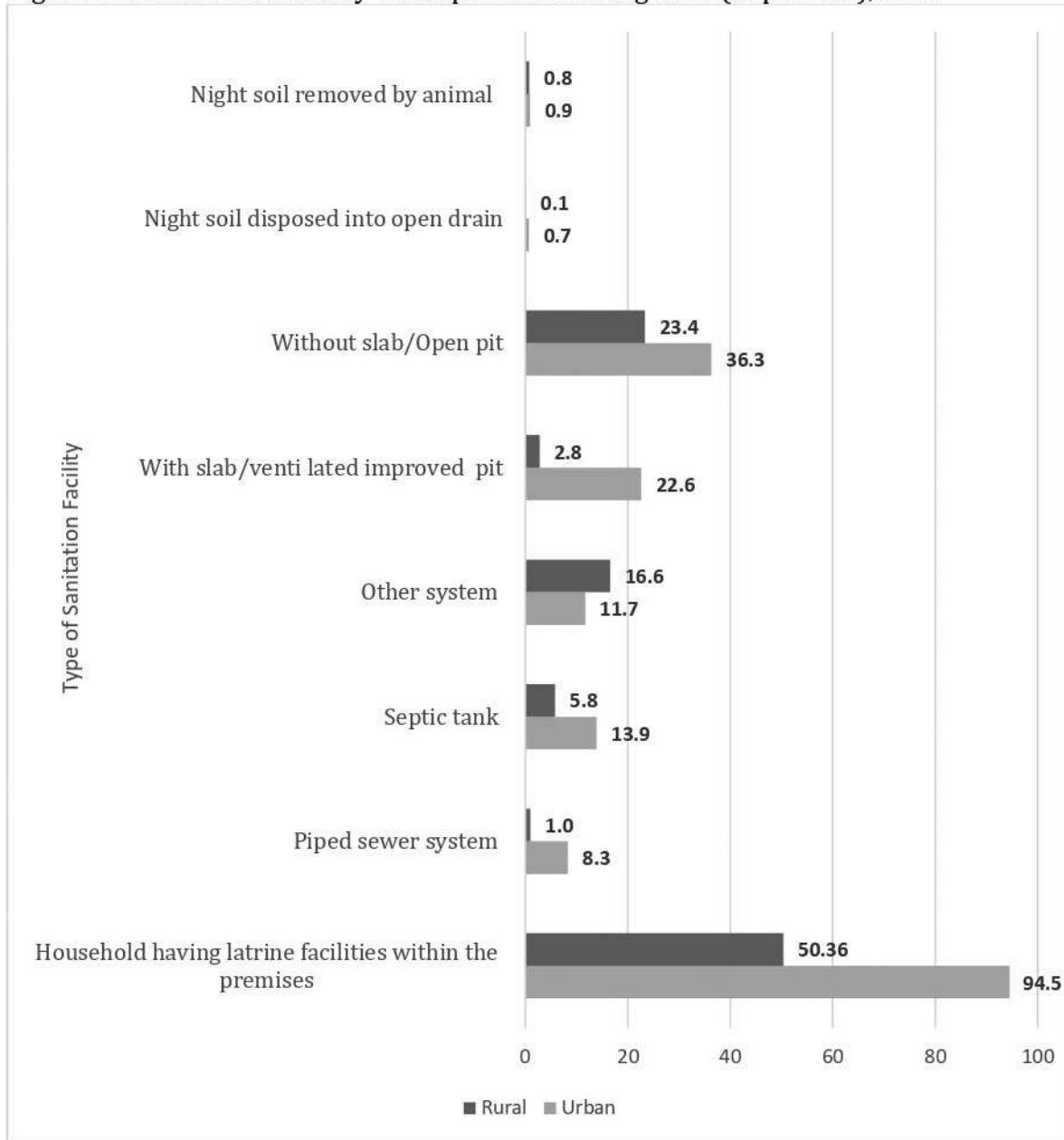
11,04,829.3 cubic meters per hour for Silapathar planning area. Considering storage capacity of the drainage network to be 15 minutes, the drainage system should be designed to store a volume of 2,76,207.3 cubic metres.

#### 6.4. Sanitation and Sewerage

Sanitation refers to treatment and safe disposal of human excreta and sewage. Public health risks are associated with mismanagement of fecal waste, black and grey water. According to census data of India 2011, only 50.36 percent of the households were connected to any type of sanitation facility while the rest resort to open defecation in rural area of Silapathar.

In comparison, 94.5 percent of urban areas of Silapathar are connected to sanitation facilities. The maximum number of toilets in the town are pit latrines (58.9 percent) followed by flush-type toilets (33.9 percent). Only 0.9 percent of the houses in the town have service latrines. A similar trend can be seen in usage of sanitation facility in rural areas with maximum dependency on pit latrines (26.1 percent) followed by flush-type toilets (23.4 percent). Only 0.8 percent of the houses in the town have service latrines (**see Figure 6.5**).

Figure 6.5: Sanitation Facility in Silapathar Planning Area (in percent), 2011



Source: Census of India (2011).

#### 6.4.1. Sanitation and Toilet Facilities in Town areas of Dhemaji District

It is observed that Silapathar town has the highest number of Pit Latrines of 3,074 as per Census 2011 when compared with other towns of Dhemaji district that is Dhemaji (TC), Jonai (TC), Lakhini Nepali (TC). Thus, Silapathar town has highest dependency on Pit Latrines service that accounts for 56.33 percent, followed by Flush and Pour Flush Latrines which accounts for 42.14 percent. latrines and other types of latrines. Out of all the toilet service latrines and other types of latrines have lowest usages in the Silapathar town which accounts for 8.4 percent and 6.7 percent respectively (**See Table 6.5**).

Table 6.5: Toilets in Town Areas of Dhemaji District, 2011

Towns	Pit Latrines	Flush and Pour Flush Latrines	Service Latrines	Other types of Latrines
Dhemaji (TC)	732	2,421	3	2
Silapathar (TC)	3,074	2,300	46	37
Jonai Bazar (CT)	515	359	46	2
Lakhi Nepali (CT)	509	442	21	8
<b>Total</b>	<b>4,830</b>	<b>5,522</b>	<b>116</b>	<b>49</b>

Source: Census of India (2011).

#### 6.4.2. Existing Situation of Sanitation in Silapathar Town

In Silapathar town, nearly 94.5 percent of the households have a latrine facility within their premises as per the Census of India, 2011. Ward wise analysis of Silapathar town shows that Ward 3 has the highest number of toilet facilities within the premises with 98.5 percent share followed by Ward 2, 4 and lastly Ward 1. Most of the households with latrines are connected to septic tanks are in Ward 2 and Ward 3 (**See Table 6.6**).

Table 6.6: Types of Toilet Facility (in percent) in Silapathar Town, 2011

Area	Household having latrine facilities within the premises	Flush and Pour Flush latrine connected to			Pit latrine		Night soil disposed into open drain	Service Latrine
		Piped sewer system	Septic tank	Other system	With slab/ventilated improved pit	Without slab/Open pit		
Ward 1	87.2	10.8	12.1	8.5	8.3	47.5	0.0	0
Ward 2	97.0	3.10	17.0	12.8	22.5	41.2	0.4	0
Ward 3	98.5	16.2	16.2	11.2	21.1	29.0	1.7	3.0
Ward 4	93.0	1.90	8.70	14.4	38.9	28.6	0.4	0
<b>Total</b>	<b>94.5</b>	<b>8.30</b>	<b>13.9</b>	<b>11.7</b>	<b>22.6</b>	<b>36.3</b>	<b>0.7</b>	<b>0.9</b>

Source: Census of India (2011).

As per the Census of India, 2011, nearly 5.5 percent of the households do not have a latrine facility within their premises in Silapathar town. The alternative sources of defecation in the town are public latrines and open defecation. Only 0.9 percent of the households utilize public latrines while the rest 4.6 percent of the households rely to open defecation. This needs to be addressed through increasing the public toilets inside the town and increasing awareness regarding negative externalities associated with it (See **Table 6.7**).

From the ward wise analysis, Ward 1 has the highest number of households not having latrine facilities within premises (12.8 percent), followed by Ward 4 (7.0 percent), Ward 2 (3 percent) and Ward 3 (1.5 percent). Also, Open Defecation is practised the most in Ward 1 and Ward 4 that is 10.7 percent and 6.8 percent respectively.

Table 6.7: Ward-wise Alternative Sources of Toilet Facility (in percent) in Silapathar Town, 2011

<b>Area</b>	<b>Household not having latrine facility within the premises</b>	<b>Alternative source</b>	
		<b>Public latrine</b>	<b>Open</b>
<b>Ward 1</b>	12.8	2.0	10.7
<b>Ward 2</b>	3.0	1.2	1.8
<b>Ward 3</b>	1.5	0.3	1.1
<b>Ward 4</b>	7.0	0.2	6.8
<b>Total</b>	5.5	0.9	4.6

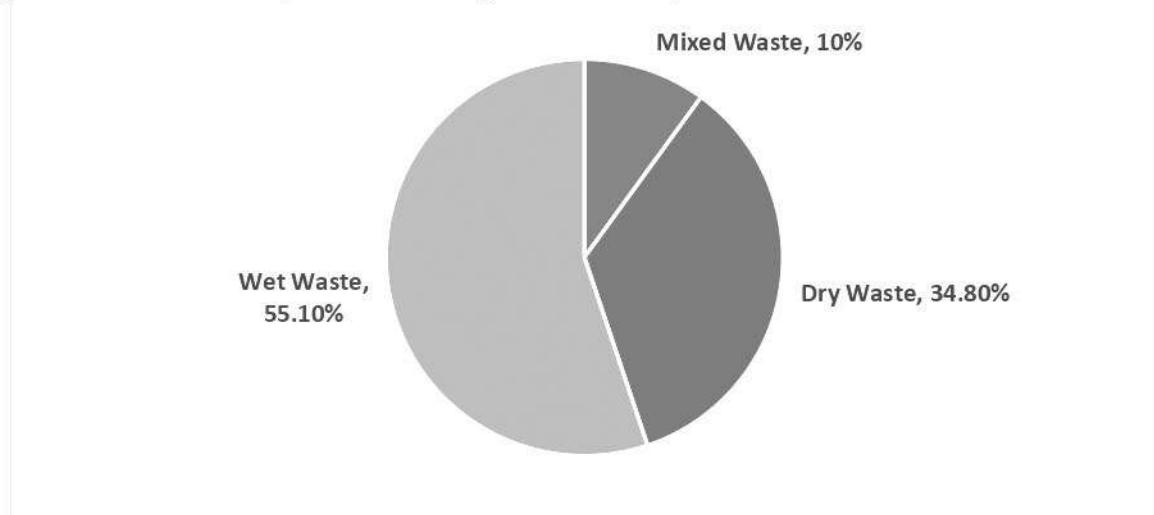
Source: Census of India (2011).

## 6.5. Solid Waste Management

### 6.5.1. Waste Composition

Waste composition in Silapathar shown in **Figure 6.6**. Total 2.85 Tons per Day (TPD) of waste is generated within Silapathar Municipal Boundary. While 5.5 tons per day of waste is generated in rural areas. About 55.1 percent of waste consists of wet waste, which accounts for 1.57 tons per day. 34.8 percent accounts for dry waste generated from household with total amount of 0.99 tons per day. 10 percent of waste is generated in the form of mixed waste that is 0.285 tons per day.

Figure 6.6: Waste Composition in Silapathar Municipal Area, 2022



Source: Silapathar Municipal Board (2022).

#### 6.5.2. Waste Collection

In Silapathar town, solid waste management is carried out in responsibility of Silapathar Municipal Board. Total waste collected is only 2 Tons per Day (TPD) that is 70.17 percent of the total. Ten vehicles are deployed to collect the solid waste within municipal area. The vehicles have separate bins for dry and wet waste as shown in **Figure 6.7**. However, at household level waste segregation is not practices. Thus, segregation of waste cannot take place at door-to-door collection stage.

Figure 6.7: Waste Collection Segregated Bins



Source: SPA Delhi, (2022).

### 6.5.3. Waste Processing and Disposal

Presently, the Total Waste Process Per Day is only 1 TPD that is only 35 percent of the total waste generated in the town. This waste processing takes place at household level. Also, There is no provision for Biomedical Waste processing under Silapathar Municipal Board.

Apart from the waste processed at household level, the rest of the waste which is collected is thrown in a dump site. The site of the dumping ground is located behind Silapathar Municipal Board Office as shown in **Figure 6.8**. Here segregation of waste takes place manually by the ragpickers. However, waste is disposed unscientifically using incineration methods openly. This is a very hazardous practice as it damages the air quality of the town and can also cause various health hazard to the people of Silapathar town.

Figure 6.8: Waste Dumping Site in Silapathar Municipal Area, 2022



Source: Silapathar Municipal Board (2022).

Figure 6.9: Waste Disposal on site, 2022



Source: SPA Delhi, (2022).

### 6.6. Conclusions

Silapathar town needs extensive development in the field of potable water supply as continuous dependency on ground water may lead to reduction of water tables. In terms

of sanitation, still 5.5 percent of the households do not have a latrine facility within their premises in Silapathar town. This results in open defecation which needs to be addressed through providing more sanitation facilities and increasing awareness related to the negative impacts of open defecation.

Solid Waste Management needs special attention in Silapathar town as the methodology used for the disposal of solid waste is unscientific and generally incineration is the most prominent method. Segregation of waste needs to be addressed immediately in Silapathar Town as there is no segregation now. Segregation of wastes will promote waste processing. In terms of effective drainage solution for a region, segregated connection of households with drain lines will lead to even bigger challenge as runoff from the household connected with drains will impact the places which does not have any connectivity to the drainage network creating waterlogging at the lower levels of the town. Thus, needs to be solved from a different perspective.

## CHAPTER 7: SOCIAL INFRASTRUCTURE

### 7.1. Introduction

In the Master Plan for Silapathar, (2041), public and semi-public includes education, health, socio-cultural, religious uses, police stations, fire stations, post and telegraph, cremation and burial grounds, etc. Education and health sectors constitute two important pillars of social infrastructure that form the foundation for economic, social including human development. While education provides the vital input for increasing the supply of trained and motivated manpower, health enables optimum utilisation of human resources.

In this chapter, education and health are analysed comprehensively. Needless to underscore that Silapathar has several education and health facilities operated by government and private sector. The existing facilities, their spatial distribution and challenges are analysed now.

### 7.2. Education

#### 7.2.1. School Education

Before the education sector is comprehensively analysed, definitions of the hierarchy of schools needs to be clearly defined.

**Primary School (P):** Schools providing education from standard 1 and upwards up to and inclusive of standard V are classified as primary schools.

**Secondary School (S):** Schools providing education from standard IX and upwards up to and inclusive of standard X are classified as secondary schools. A composite school with 1 to X standard is treated as three separate units and counted separately under the categories of primary school, middle school, and secondary school.

**Senior Secondary School (SS):** Schools and colleges that provide education for standards XI and XII and first and second year of the pre-university course fall under this category. There are senior secondary schools with standard 1 and upwards up to standard eighth.

Free and compulsory education is provided in Assam to the students up to the age of 14 years. Some of the significant schemes under secondary education department in Assam are as follows:

**'AAROHAN', for mentoring and monitoring of talented students from the remote, rural, and poor families:**

Government has initiated a series of ambitious programmes to improve the quality of Secondary Education segment. 'AAROHAN', is one such initiative, for the identification of talented students from the remote, rural and poor families for the mentoring and monitoring of their academic career.

**'SAPTADHARA' under RMSA:**

This is a unique scheme for imparting education especially in extracurricular activities and for providing an opportunity to every young child to explore Global knowledge on skill based innovative teaching learning tactics. SAPTADHARA scheme has been implemented in 324 Higher Secondary Schools and 51 Junior Colleges across the State.

**Repository of educational records:**

Government of Assam has proposed an electronic platform for creation of repository of educational records of students for easy maintenance and instant access to all stakeholders with due permission.

**Distribution of free bicycles to BPL Girls students up to Class-X studying in Govt. and provincialized High/Higher Secondary School":**

With an objective of reducing the dropout rate of Girls students at Secondary level and to increase enrollment of Girls, Government of Assam is providing free bicycles to school going Girls up to Class-X studying in Govt. and provincialized High/Higher Secondary Schools. Increasing Mobility and Socialization are the positive outcomes that have been observed amongst the school going girls. This has resulted in easy transportation for the Girls.

**Waiving of Admission Fees for the students in Class XI in all Higher Secondary Schools/Colleges provided that the income of their parents is below or Rs.1.00 lakh (Rupees one lakh) only per annum from all sources:**

Government of Assam in the Secondary Education Department decided that no provincialized / Government Higher Secondary Schools and Junior Colleges of Assam will

take fees including admission fees, tuition fees and any other fees from the students who will take admission in the HS 1st year provided that the income of their parents is below or Rs.1.00 lakh (Rupees one lakh) only per annum from all sources.

The town or village wise data for educational facilities that are available in Dhakuakhana are shown in **Table 7.1** and **Table 7.2** respectively.

Table 7.1: Existing Educational Facilities in Silapathar Town, 2022

Town	Total Population	Primary School		Secondary School		Senior Secondary School	
		Requirement	Current Availability	Requirement	Current Availability	Requirement	Current Availability
Silapathar	25,662	5	18	4	7	4	1

Source: SPA New Delhi, (2022) and URDPFI Guidelines 2015

Table 7.2: Existing Education Facilities in Silapathar Villages, 2022

Sl. No.	Census Code	Village (Census Name)	Total Population	Govt. Primary School	Govt. Secondary School	Govt. High Secondary School
1	288854	No.1 Borpathar Gohain (Part)	1,204	2	0	0
2	288855	Phulbari Pathar (Part)	257	1	0	0
3	288857	No.2 Phulbari Nepali Block	615	1	0	0
4	288858	No.1 Phulbari Nepali Block	572	1	0	0
5	288859	Phulbari Bangali Gaon	356	1	0	0
6	288861	Barati Chuk	428	1	0	0
7	288862	Barati Gaon	510	1	0	0

<b>Sl. No.</b>	<b>Census Code</b>	<b>Village (Census Name)</b>	<b>Total Population</b>	<b>Govt. Primary School</b>	<b>Govt. Secondary School</b>	<b>Govt.High Secondary School</b>
8	288880	No.2 Betanipam	558	1	1	0
9	288883	Chila Gaon	1,177	1	1	0
10	288886	Kulamua Block	1,619	1	0	0
11	288888	Kulamua Barua Gaon	315	1	0	0
12	288889	Gelua Gaon	219	1	0	0
13	288910	Kulamua Kachari	335	1	0	0
14	288911	Kulamua Gaon	705	1	0	0
15	288912	Kulamua Bangali	2,143	1	1	0
16	288913	Mishing Pur	329	1	1	0
17	288914	Member Chuk	591	1	0	0
18	288917	No.6 Borgayadeori	218	1	0	0
19	288920	Jon Gaon Nepali	168	0	0	0
20	288922	Akajan Bangali	245	1	0	0
21	288924	Akajan Miri	1,470	1	1	1
22	289066	Rupahi Borgayan	438	1	0	0
<b>Total</b>			<b>14,472</b>	<b>22</b>	<b>5</b>	<b>1</b>

Source: Census of India, Assam (2011)

Thus, for the population of 14,472 within the villages, the gap in the educational facilities as per URDPFI guidelines 2015 is provided as below in **Table 7.3.**

Table 7.3: Gap in Educational Facilities in Silapathar Villages, 2022

<b>Total Population</b>	<b>Govt. Primary School</b>		<b>Govt. Secondary School</b>		<b>Govt. Senior Secondary School</b>	
	<b>Requirement</b>	<b>Current Availability</b>	<b>Requirement</b>	<b>Current Availability</b>	<b>Requirement</b>	<b>Current Availability</b>
14,472	3	22	2	5	2	1

Source: Census of India, Assam (2011) and URDPFI Guidelines 2015

Hence, it is observed that there is lack of government senior secondary schools within the villages and as well as town area of Silapathar.

#### 7.2.2. Higher Education

As per 2011 census data there is one Government College in entire Urban Area of Dhemaji District i.e. in Silapathar CT. Silapathar TC is also the only town, which has three Private Degree College-Art, Science and Commerce, but however there is no university, medical college, Management College, Law College, engineering college and polytechnic institute in Silapathar, although these facilities are available in Dibrugarh town. The higher education facilities available in Silapathar are shown in **Table 7.4** as follows:

Table 7.4: Higher Education Facilities in Silapathar, 2022

<b>Sl. No.</b>	<b>Type of Education Facility</b>	<b>Discipline</b>	<b>Current Availability</b>
1	Government Degree College	Art, Science and Commerce	1
		Law	0
2	Private Degree College – Art, Science and Commerce	Art, Science and Commerce	3
		Law	0
<b>Total</b>			<b>4</b>

Source: SPA New Delhi, (2022) and URDPFI Guidelines 2015

#### • Silapathar Town College

It was established in 1993 as Silapathar Women's College. But due to consistent demand from public the college transformed itself to a co-education institution with Govt.

permission and official gazette. The college is equipped with national standard sports training complex, multi-gymnasium, and girl's hostel. Proposals for virtual class room, digital library and many more facilities are there which are to be funded by state government as well as UGC.

The college provides post-Graduation programme in English, Assamese, Political Science, Economics, Sociology & Mathematics & Education under Directorate of open & Distance Learning Dibrugarh University. The college provides vocational and self-employment programme with technical experts from Govt. and non-Govt. agencies.

#### • **Silapathar College**

The college was established in 1979. The college offers regular programmes in Arts Faculty at two levels. The first is the Higher Secondary Course leading to undergraduate level and the second the Undergraduate Course leading to Bachelor of Arts. The duration of the former is of two years while that of the latter of three years. The syllabuses of the Higher Secondary and the Undergraduate levels are designed by the Assam Higher Secondary Education Council and the Dibrugarh University respectively. **Table 7.5** and **Table 7.6** shows the art courses and the programmes offered in this college.

**Table 7.5: Arts Courses in Silapathar College**

<b>Sl. No.</b>	<b>Courses</b>	<b>Subjects Offered</b>
1	Higher Secondary Course	English
		MIL (Assamese/ Bodo/ Hindi)
		Alternative English instead of MIL
		Economics
		Education
		History
		Logic & Philosophy

<b>Sl. No.</b>	<b>Courses</b>	<b>Subjects Offered</b>
2	Undergraduate Course (Arts) Under Semester System	Political Science
		Elective Assamese
		Sociology
		English
		Assamese
		MIL (Assamese/ Bodo/ Hindi/ Nepali)
		Education
		Alternative English instead of MIL
		Economics
		History

Source: Silapathar College Website

Table 7.6: Programmes Offered in Silapathar College

<b>Sl. No.</b>	<b>Programmes</b>	<b>Courses</b>	<b>Subjects Offered</b>
1	Post – Graduate	Master of Arts (M.A)	English
			Assamese
			Economics

			Political Science
			Sociology
			Education
2	Under - Graduate	Bachelor of Arts (B.A Pass)	MIL (Assamese)
			Education
			Alternative English
			Economics
			Political Science
			Sociology
			Tribal Studies
3	Programmes under Krishna Kanta Handiqui State Open University (Kkhsou)	B. A	-
4	Certificate Programmes	CCA (Certificate Course in Computer Application)	-
		CMPR (Certificate Course in Mobile Repairing)	-
5	Bridge Course	BPP (Bachelor Preparatory Programme)	-

Source: Silapathar College Website

**• Silapathar Science College**

Silapathar Science College was established in 1996. At present, it offers Bachelor of Science (BSc.) programmes (Honours and Non-honours) at the Undergraduate level under Dibrugarh University and Master of Science (M.Sc.) programme (Botany and Zoology) at the Post Graduate level under Assam Science & Technology University (ASTU). It is permanently affiliated to Dibrugarh University for UG level and temporarily affiliated to ASTU for PG level Courses. The courses offered under various disciplines are shown in

**Table 7.7.**

Table 7.7: Courses Offered in Silapathar Science College

S. No.	Courses	Subjects
1	10 + 2/ Senior Secondary	English
		MIL (Assamese / Bodo)/Alt. English
		Anthropology
		Biology/ Introductory Computer Application
		Chemistry
		Mathematics
		Physics
2	Bachelor of Science (B.Sc)	Anthropology
		Botany
		Chemistry
		Mathematics
		Physics
		Zoology

Sl. No.	Courses	Subjects
3	Diploma in Information Technology	-
4	Diploma in Herbal Medicinal Plants	-
5	M.Sc in Zoology	-
6	M.Sc in Botany	-

Source: Silapathar Science College Website

### 7.3. Healthcare

As of census 2011, Silapathar town has 1 Hospital (Allopathic) which has 30 beds which serves most of the patients in the town. There is also 1 Dispensary Health centre with 6 beds, 1 Maternity Home with 5 beds and 1 Veterinary Hospital with total 3 beds. Medical facilities like Family well fare, Maternity and Child Welfare, Nursing home and Mobile Clinic Health are not in the town premises and are located 5-17 km away from the town.

Table 7.8: Existing Healthcare Facilities in Silapathar Town, 2022

Town	Total Population	Healthcare Facilities	Requirement	Current Availability
Silapathar	25,662	Pharmacy/ Non-government medical shops	-	14
		Dispensary/ Health Centre	2	1
		Maternity Home	1	1
		Hospital	-	1
		Speciality Hospital (TB Hospital)	-	1
		Veterinary Hospital	-	1

Source: SPA New Delhi, (2022) and URDPFI Guidelines 2015

Table 7.9: Existing Healthcare Facilities in Silapathar, 2022

<b>Sl. No.</b>	<b>Census Code</b>	<b>Village (Census Name)</b>	<b>Total Population</b>	<b>Community Health Centre</b>	<b>Primary Health Centre</b>	<b>Primary Health Sub- Centre</b>	<b>Maternity and Child Welfare Centre</b>
1	288854	No.1 Borpathar Gohain (Part)	1,204	0	0	0	0
2	288855	Phulbari Pathar (Part)	257	0	0	0	0
3	288857	No.2 Phulbari Nepali Block	615	0	0	0	0
4	288858	No.1 Phulbari Nepali Block	572	0	0	0	0
5	288859	Phulbari Bangali Gaon	356	0	0	0	0
6	288861	Barati Chuk	428	0	0	1	0
7	288862	Barati Gaon	510	0	0	1	0
8	288880	No.2 Betanipam	558	0	0	1	0
9	288883	Chila Gaon	1,177	0	0	0	0
10	288886	Kulamua Block	1,619	0	0	0	0
11	288888	Kulamua Barua Gaon	315	0	0	0	0
12	288889	Gelua Gaon	219	0	0	0	0

13	288910	Kulamua Kachari	335	0	0	0	0
14	288911	Kulamua Gaon	705	0	0	0	0
15	288912	Kulamua Bangali	2,143	0	0	0	0
16	288913	Mishing Pur	329	0	0	0	0
17	288914	Member Chuk	591	0	0	0	0
18	288917	No.6 Borgayadeori	218	0	0	0	0
19	288920	Jon Gaon Nepali	168	0	0	0	0
20	288922	Akajan Bangali	245	0	0	0	0
21	288924	Akajan Miri	1,470	0	0	1	0
22	289066	Rupahi Borgayan	438	0	0	0	0
<b>Total</b>			<b>14,472</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>0</b>

Source: Census of India, Assam (2011)

Table 7.10: Gap in Healthcare Facilities in Silapathar Villages, 2022

Total Population	Community Health Centre		Primary Health Centre		Primary Health Sub-Centre		Maternity and Child Welfare Centre	
	Requirement	Current Availability	Requirement	Current Availability	Requirement	Current Availability	Requirement	Current Availability
14,472	2	0	1	0	2	4	2	0

Source: Census of India, Assam (2011) and RADPFI Guidelines 2016

#### 7.4. Recreation

At present there are no recreational facilities in Silapathar. As per URDPFI Guidelines 2015 it is suggested to provide 1.0 to 1.2 ha per 1000 persons for town level open spaces (excluding the open spaces in residential pockets), which can be distributed for different residential pockets uniformly for a population of 8000 to 10,000. (Calculation based on the 10 12 m / person for the entire planned areas). **Table 7.11 and Table 7.12** respectively shows the gap in organised green spaces and sports facilities in Silapathar.

Table 7.11: Gap in Organised Green Spaces in Silapathar, 2022

<b>Administration</b>	<b>Total Population</b>	<b>Housing Area Park</b>		<b>Neighbourhood Park</b>	
		<b>Requirement</b>	<b>Current Availability</b>	<b>Requirement</b>	<b>Current Availability</b>
Town	25,662	5	0	2	0
Villages	14,472	3	0	1	0
<b>Total</b>	<b>40,134</b>	<b>8</b>	<b>0</b>	<b>3</b>	<b>0</b>

Source: SPA New Delhi, (2022) and URDPFI Guidelines 2015

Table 7.12: Gap in Sports Facilities in Silapathar, 2022

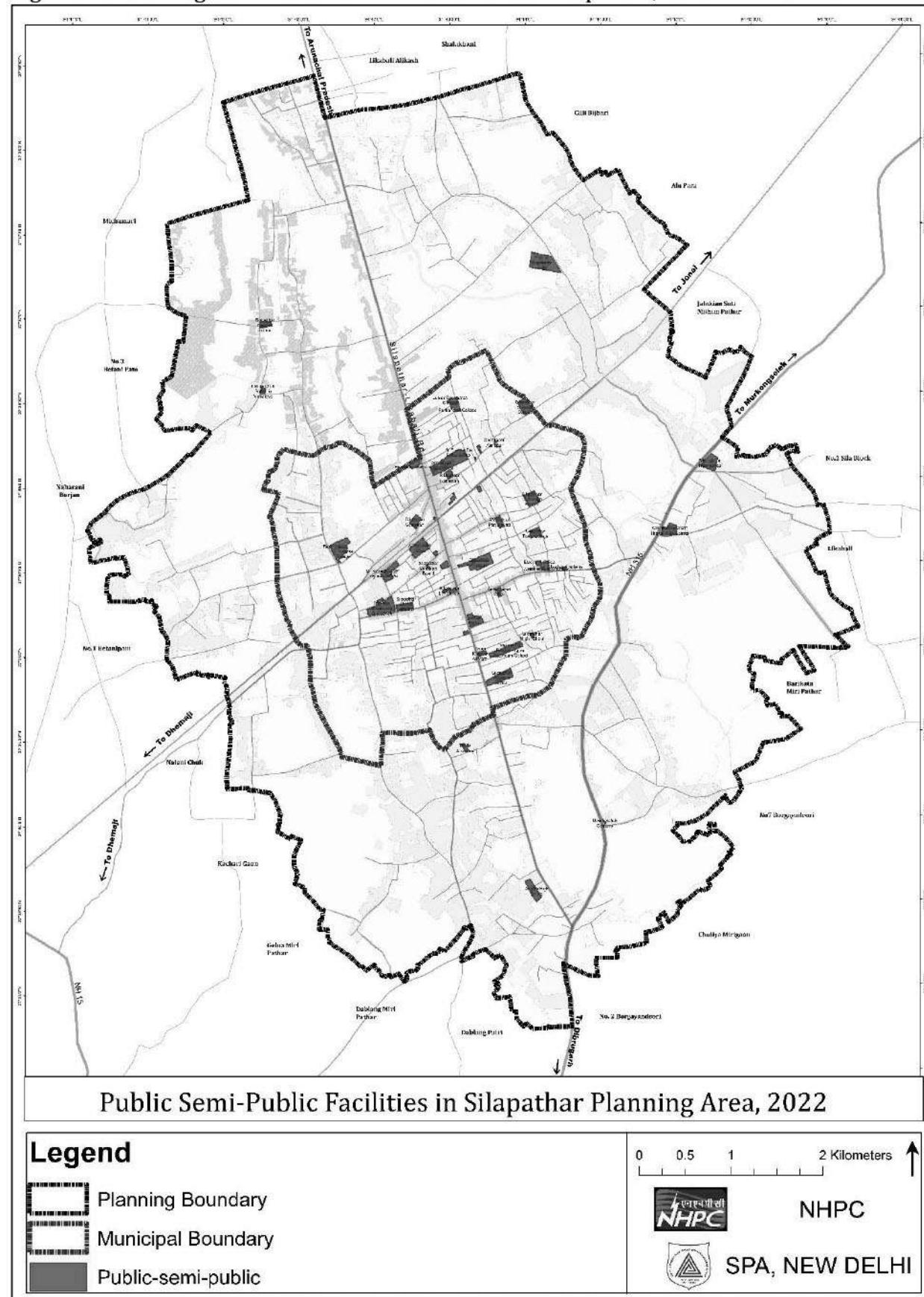
<b>Administration</b>	<b>Total Population</b>	<b>Residential Unit Play Area</b>		<b>Neighbourhood Play Area</b>	
		<b>Requirement</b>	<b>Current Availability</b>	<b>Requirement</b>	<b>Current Availability</b>
Town	25,662	5	0	2	0
Villages	14,472	3	0	1	0
<b>Total</b>	<b>40,134</b>	<b>8</b>	<b>0</b>	<b>3</b>	<b>0</b>

Source: SPA New Delhi, (2022) and URDPFI Guidelines 2015

The existing social infrastructure facilities in Silapathar are thus shown below in

**Figure 7.1**

Figure 7.1: Existing Social Infrastructure Facilities in Silapathar, 2022



Source: SPA New Delhi, (2022)

### 7.5. Fire Safety

The town has one fire station which is located inside the town premises. The station has one 4500 Litres and one 3000 litres fire truck and a mini-Van. The fire station is headed by a Sub Officer however a station Officer is required in the post which is vacant. Currently there is one Leading fire man (LFM) but 4 is needed, ten fire men for which 2 more is needed, five rescuers for which 5 more is needed and three drivers, one additional driver is required.

### 7.6. Cremation and Burial Ground

According to primary survey, there are two Burial Ground and one Cremation ground in Silapathar Planning area. Cremation ground is known as Silapathar Samshan and is located near Railway Station. Burial Ground which is known as Silapathar Kabristan is located near Don Bosco High School and Memberchuk Cemetery is located on the National Highway (**see Figure 7.1**).

### 7.7. Conclusions

Silapathar town lacks university, medical college, Management College, Law College, Engineering College, and Polytechnic institutes. Catering to the total population of the town Silapathar town has only one hospital having a total of only 15 beds which is very less and most of the health care facilities like Family well fare, Maternity and Child Welfare, Nursing home and Mobile Clinic Health are not in the town premises for which one has to travel 5-17 kms to access the service. Both education and Health care facilities needs to be increased in the town to meet the needs of the town.

There are no such organised green space and sports facility present in the planning area which are to be proposed at urgent basis. Silapathar lacks in socio – cultural facilities like anganwadi, community halls which are to be introduced. To ensure optimum utilisation and maintenance and management of community buildings, the use of such facilities shall be planned and designated for multi-purpose activities. Activities such as adult education, training programmes for economic generation activities, child and family welfare programmes etc. can be organised in such spaces. Petrol pumps and police stations are also required in Silapathar.

## CHAPTER 8: ENVIRONMENT AND DISASTERS

### 8.1. Introduction

The more intense weather patterns brought on by long-term global climate change has increased the likelihood of environmental degradation and calamities like earthquakes, flooding, cyclones, etc. Climate change alone has varied impact on the physical environment, ecosystems, and human society.

This chapter will discuss the environmental condition and disaster situation of Silapathar town, which will help us understand the environmental scenario and how these environmental aspects will affect the development of the town. This chapter also analyses the types of disasters the town faces which creates economic, infrastructure, and environmental challenges. Silapathar town is prone to earthquakes, storms, and frequent flooding. Therefore, adequate emphasis could be placed on protecting environmentally sensitive and disaster-prone areas. It is also important to note that most of the related data are based on the regional context and are not available on the town level of Silapathar town.

### 8.2. Environment and its Characteristics

#### 8.2.1. Water Quality

The ground water quality status as per the Central pollution control board, 2020 states that the pH value of the water in Silapathar was 7.1 which is neutral as compared to the previous years 2019 and 2018 which shows the improvement in the quality of water. Water having pH value lower than 7 may contain iron which may be harmful for consumption. Conductivity test of the water also shows that the water is at normal range and is not saline in nature. The Biochemical oxygen demand (BOD) which is a measure of the amount of oxygen required to remove waste organic matter from water has to be less than 5 mg/l and the BOD level of the water in Silapathar is lesser than the standard benchmark which states the water is safe for consumption. Nitrate level above 10 mg/l or 10 ppm are unsafe for consumption and can cause blood oxygen problems for which the current status of the Nitrate level is also below 10 mg/l which is safe (**See Table 8.1**).

Table 8.1: Water Quality of Ground Water in Silapathar, 2020

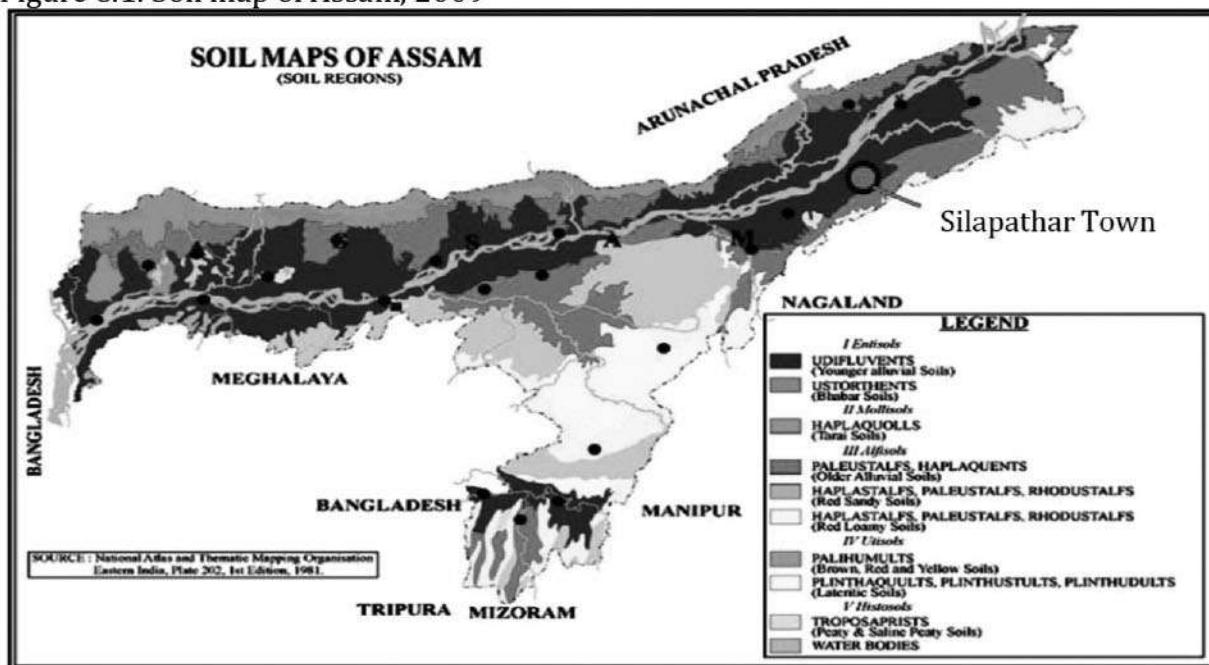
Year	Temperature in °C		pH		Conductivity (μmhos/cm)		BOD (mg/L)		Nitrate + Nitrite (mg/L)		Faecal Coliform (MPN/100ml)		Total Dissolved Solids (mg/L)	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
2020	23	25	7.1	7.1	41	408	1.1	1.9	BDL	0.5	BDL	BDL	30	220
2019	18	24	6.8	6.9	23	191	1.2	1.8	0.8	1	2	2		
2018	15	24	6.3	6.4	234	250	4.6	4.8	0.6	1.9	2	2		

Source: Central pollution Control Board, (2020).

### 8.2.2. Soil Quality

The characteristics of the soil in this region are broadly classified into four groups, new alluvial, old alluvial, red loams, and laterite soil. The new alluvial soil is found in the flood plain areas like Silapathar which are subjected to occasional floods and consequently receives annual silt deposit when the flood reduces. Water logging and erosion in the town and surrounding areas has reduced the quality of soil.

Figure 8.1: Soil map of Assam, 2009



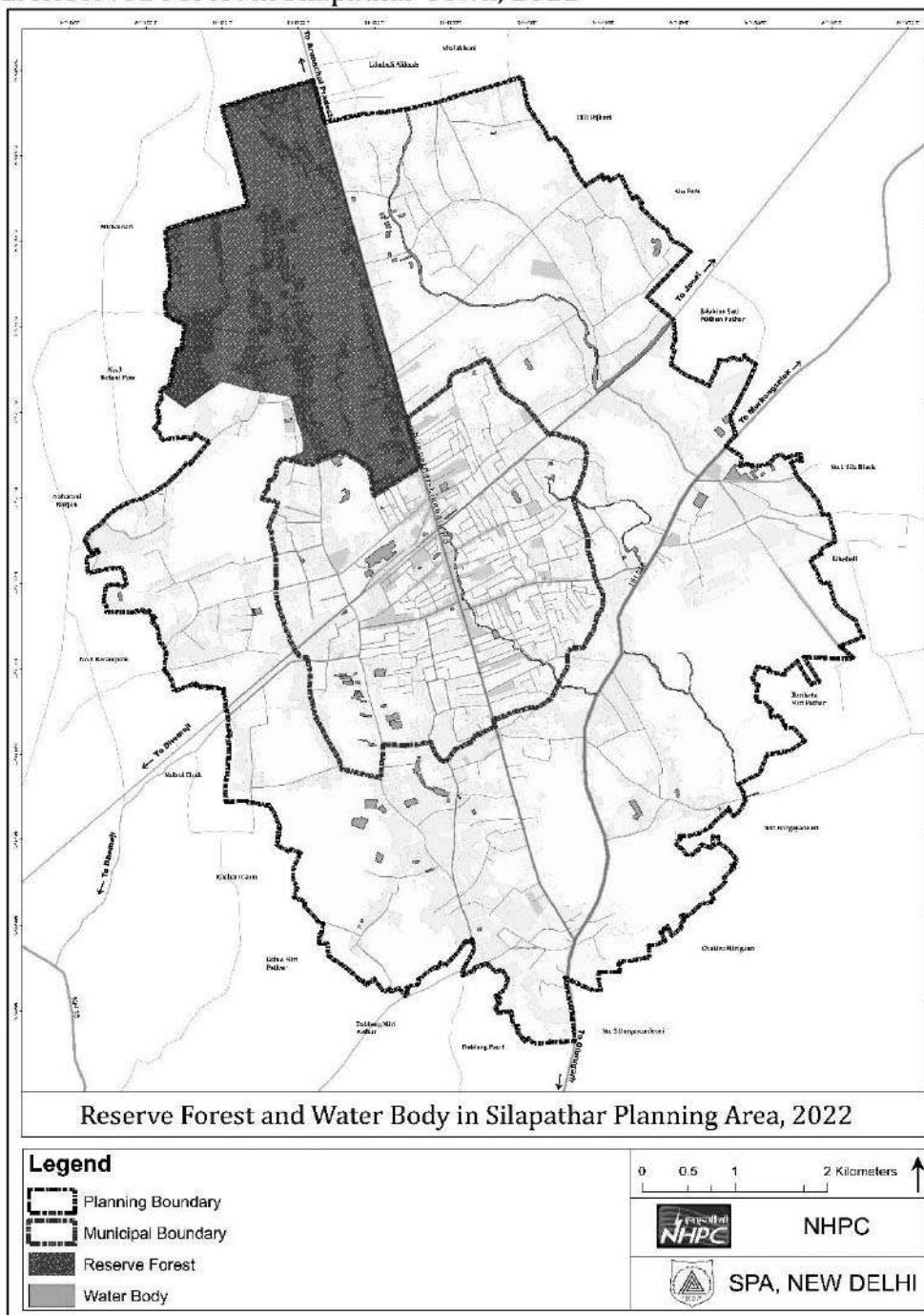
Source: Assam Contingency Plan, (2009)

### 8.2.3. Reserve Forest

Reserved forests are areas of forest or other lands (including natural landscapes such as savanna grasslands, which are officially classified as "wastelands") that can be designated as such by state governments. This is legally mandated by the Indian Forest Act of 1927.

Reserved forests, like protected areas, provide habitat for many endemic, endangered, and protected species. Silapathar has 663 hectares of reserved forest within its planning boundary. However, most of it has been encroached by haphazard development in this ecologically sensitive area. Out of the 663 hectare of reserved forest, 90.5 hectare has been occupied by residential land-use, 0.7 hectare has been occupied by Public-Semi Public land-use and commercial land-use has occupied 2.85 hectare,

Figure 8.2: Reserved Forest in Silapathar Town, 2022



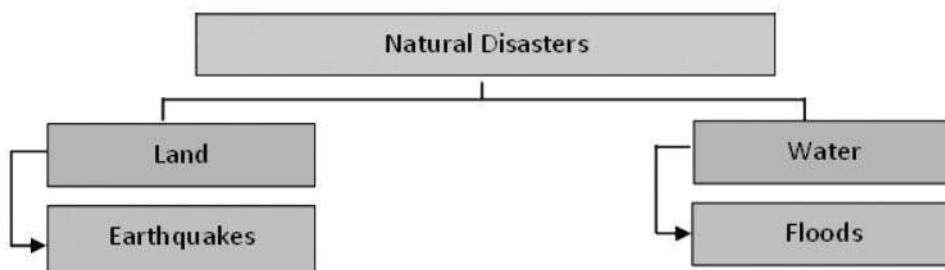
Source: SPA New Delhi (2022).

### 8.3. Disaster Management

The State of Assam is prone to multiple natural calamities like landslides, storms, heavy rainfall, and floods. Assam has a history of major disasters ranging from heavy earthquakes to heavy rainfall followed by floods which has been a major task to tackle. Silapathar also receives heavy rainfall which causes flash floods in most of the areas leaving behind damages to properties and is also prone to earthquakes which had occurred multiple times in the past.

Figure 8.3: Types of Environmental Disaster

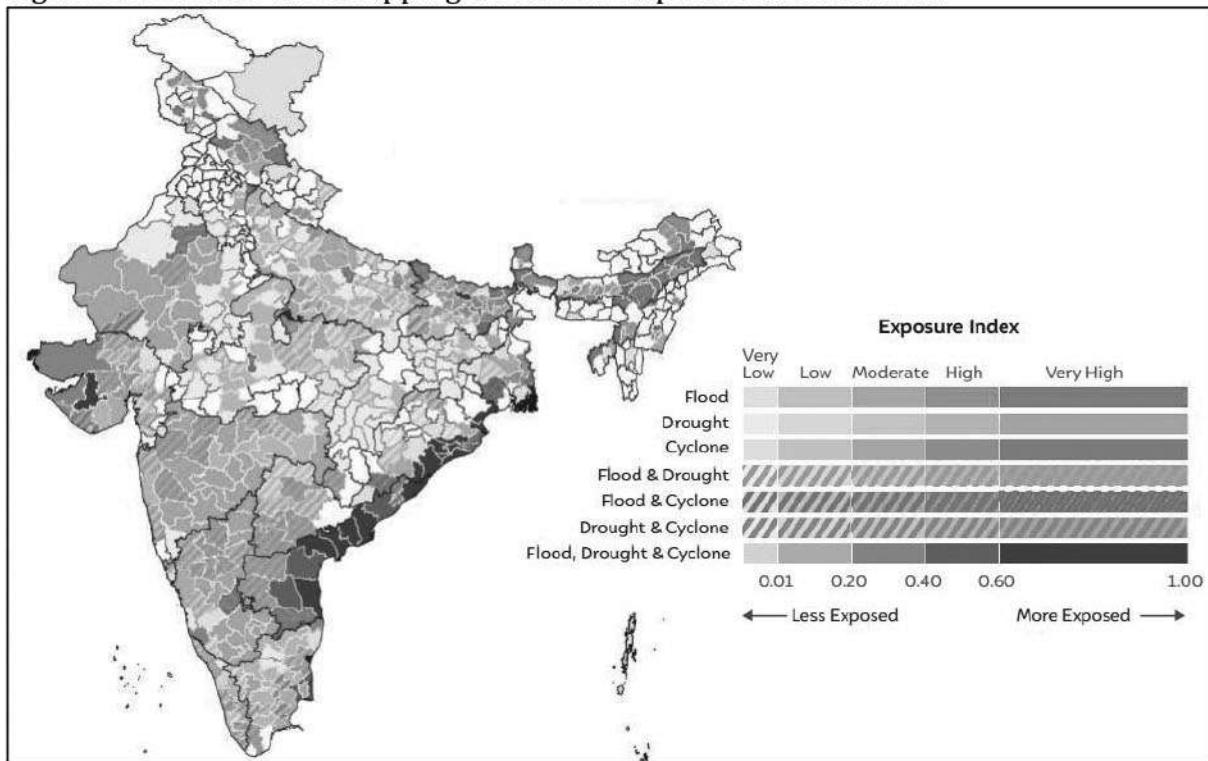
Source: Primary survey, SPA New Delhi (2022).



#### 8.3.1. Floods

Rivers and tributaries in Assam are liable to flood during heavy rainfalls. Floods and flash floods are not as extreme as compared to other towns in Silapathar, but they are mainly caused by the excessive rainwater carried by the nearby rivers and tributaries gushing down from the hills of Arunachal Pradesh. The riverbeds of these rivers are very shallow which causes overflowing of its water body after every spate of heavy showers during rainy seasons and affecting the areas nearby. Given the plain topography and no proper drain outlet, the area is prone to floods and flash floods during the monsoon seasons. The exposure index mapped for Indian districts shows that north-eastern zone of India is highly exposed to extreme flood events. Silapathar lies in Dhemaji district which is the most vulnerable to extreme floods and has experienced an exponential increase in the frequency of flood events since 2010 as per exposure indexing calculated based on frequency and intensity of the disaster (Mohanty, 2021) (**See Figure 8.4**).

Figure 8.4: District-wise Mapping of Disaster Exposure Index in India



Source: (Mohanty, 2021)

Listed below are some of the areas in Sisiborgaon revenue circle where the areas are most vulnerable and prone to floods.

- Simenmukh G.P
- Silasuit G.P
- Muktiar G.P
- UjjaniSissiTngani G.P
- NamoniSissiTangani G.P
- Madhya SissiTangani G.P
- Borlong G.P
- Amguri G.P

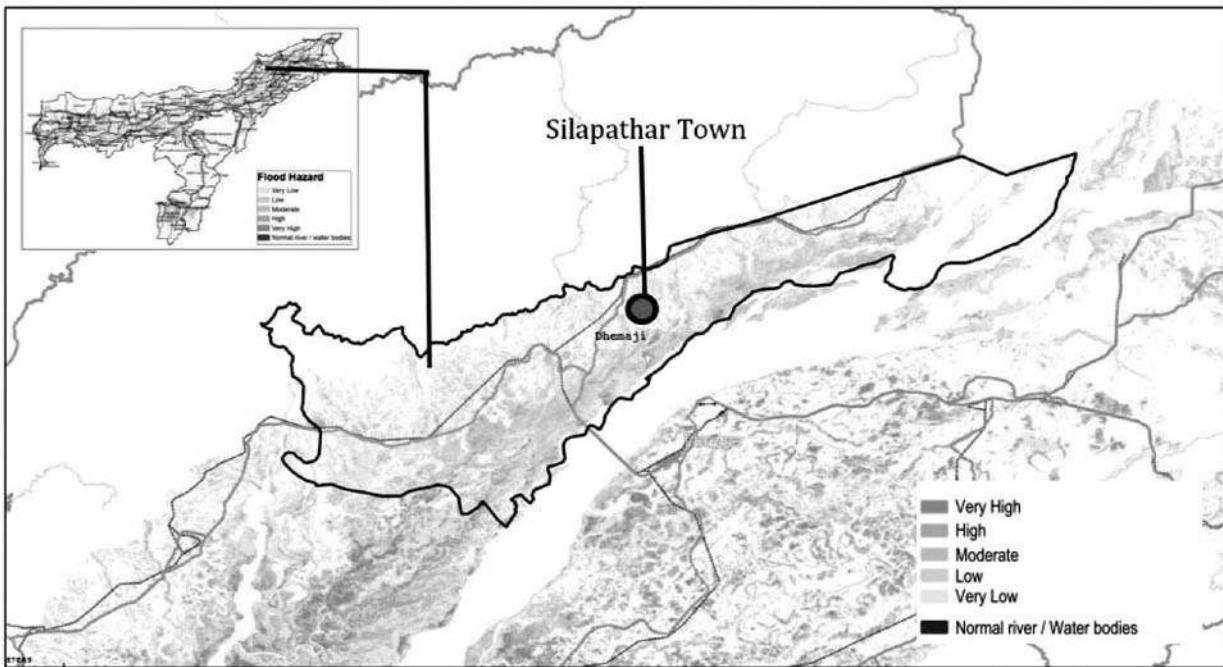
The Sisiborgaon Circle has been divided into 4 Flood zone areas and each zone has been placed under an officer to look after during the occurrence of flood apart from concern LR staff (**See Table 8.2**).

Table 8.2: Flood Zone details of Sisiborgaon Revenue Circle, 2018

<b>Zone no</b>	<b>Name of G.P</b>	<b>Name of officer Entrusted</b>	<b>Name of L.M</b>
1	Nilakh G.P, Sripani G.P. &Betonipam G. P	C.D.P.O Sisiborgaon	1.Sri Kriti Nath Bania 2.Sri Jitul Duwari 3.Sri Numal Taye
2	Sisiborgaon G.P., Amguri G.P., Malinipur G.P. & Silapathar G.P.	S.D.O. Agriculture	1.Sri Premedhar Chutia 2.Sri NareswarHazarika 3.Sri Jitu Saikia
3	UjjaniSissiTangani, NamoniSissiTongani , Madhya SissiTongani, Borlung, Kulajan G.P.	A.E.E. Irrigation, Silapathar	1.Sri Moni Kt.Kuli 2.Md. Manuwar Hussain 3. Sri Nareswar Hazarika
4	Silasuti, Dimow, Muktiar, Simenmukh, Akajan G.P.	D.O. Soil conservation Silapathar	1.Sri Kritibash Roy 2.Sri Pranjyoti Bhuyan 3.Sri Sukheswar Bhuyan 4. Sri Daruga Malah.

Source: District Disaster Management Authority Dhemaji, (2018).

Figure 8.5: Flood Hazard Map of Dhemaji District showing Silapathar Town



Source: Bhuvan-NRSC

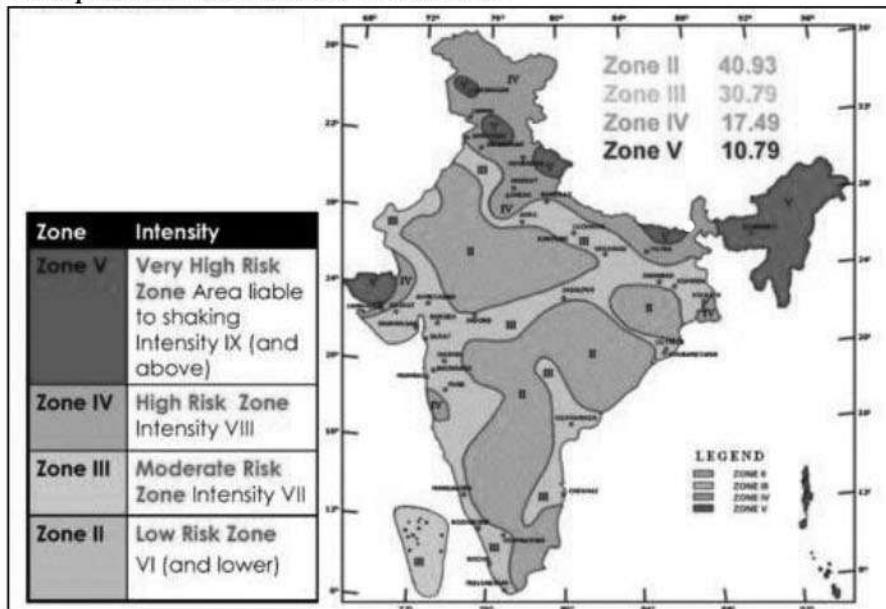
List of Institute for Sheltering flood affected people in Silapathar town are given below.

- Silapathar College.
- Silapathar Residential H.S. School.
- Silapathar Commerce College.
- Silapathar Science College.
- Silapathar M.V. School.
- Don Bosco Silapathar
- Silapathar Honumangadi Hindi M.E.
- Silapathar Public Eng. School.
- Silapathar Town L.P.

### 8.3.2. Earthquake

Silapathar falls under the seismic zone V as per the Bureau of India Standards. The town of Silapathar and its surrounding region have a long history of earthquake events. There are 82 earthquake events which occurred near Silapathar with magnitude ranging from 3.7-6.2 magnitude. After the earthquake, the river Brahmaputra bed is continuously rising due to deposition of sand carried from the upper stream (**See Figure 8.6**).

Figure 8.6: Earthquake Zones of India and Assam



Source: nidm.gov.in

#### 8.4. Conclusions

Quality of water in the region of Silapathar seems to be improving over the years with the pH scale being at neutral 7.1 compared to the previous years 6.9 and 6.4. The BOD level was very high during the year 2018 accounting to 4.8 mg/l, however the BOD level has reduced over the years making ground water suitable for consumption. The BOD level has to be less than 5 mg/l or else the water will get contaminated. Nitrate level was also below 10mg/l i.e., 0.5 mg/l during the year 2011 making it a safe factor for consuming the water.

However, the town falls under seismic V of the earthquake zone making it very vulnerable to small and big earthquakes. The town of Silapathar is also prone to flash floods during heavy rainfall due to the plain topography of the area and due to the non-availability of proper drain outlet inside the town which needs further planning to mitigate the problem of flooding issues.